

GLEN CANYON NATIONAL RECREATION AREA

MANUAL OF BOAT OPERATIONS

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600. Purpose of Manual

Many of the official activities carried on in the administration of Glen Canyon National Recreation Area require duties involving the use of boats. The great inland sea of Lake Powell with its 1800 miles of canyon shorelines and wide embayments presents a challenge that needs more than an amateur boatman to navigate it with consistent skill and safety during all its moods and through all our duties upon it. The swift and turbulent Colorado River presents a different challenge requiring expert river running techniques. The efficiency, with its implied safety, we achieve will be gained from thoughtful, consistent operations among our boating employees. This manual has been prepared as an operational guide to:

1. Provide specific instructions and directives to safeguard personnel.
2. Encourage uniform actions that lead to efficient operations.
3. Provide indoctrinational instructions to new employees.
4. Prevent costly and inoportune damage to equipment.

601. Flexibility of Manual

The expanding organization and operations, along with the acquisition of new equipment, makes it mandatory that this manual be revised at intervals if it is to maintain its usefulness. The format has been adopted for that purpose.

602. Official Boating Activities

Administrative requirements necessitating the use of official boats may be generally grouped as follows:

Management Activities

Transportation to outlying areas
Inspection trips
Planning trips
Public relations
Supply to outlying areas
Interpretive functions

Protection Activities

Visitor Safety
Law Enforcement
Search and rescue
Patrols
Supply of stations
Others

Maintenance and Construction

Transportation to outlying areas for the various purposes of construction of facilities and their maintenance and repair.

603. Boat Operations Branch

The organizational division of responsibilities in Glen Canyon National Recreation Area establishes the Boat Operations Branch, under the direct supervision of the Chief Park Ranger.

603.1. Responsibilities of the Boat Operations Branch

The primary functions of the Boat Operations Branch are:

1. Coordination of water transportation to meet the demands of the various administrative divisions.
2. Supervision of the official boating activities including boating safety, routine maintenance of boats and related equipment, and responsibility for readiness of watercraft.
3. Training of employees in boat operation.
4. Safety and condition inspections of official boats.
5. Coordination with Maintenance Division with regards to maintenance and repair of boats and related equipment.

604. Assignment of Boats and Water Transportation

Requests for water transportation of personnel and materials shall be made to the office of the Chief Ranger in accordance with current instructions.

605. Maintenance and Repair of Boats and Marine Equipment

All maintenance and repair, other than authorized routine and emergency, will be carried out by or under the supervision of the Maintenance Division and Boat Operations Branch.

606. Reporting Items or Conditions Requiring Repairs

Any condition of boats or marine equipment requiring repairs or service will be reported to the Chief Ranger as soon after the discovery as possible. Any repairs made in the field should be reported as soon after your return to headquarters as possible.

607. Superintendent's Memorandum Number 16
Boat Operations and Dispatching

Included in this manual on two pages following.

GLEN CANYON NATIONAL RECREATION AREA
BOX 1507
PAGE, ARIZONA

607.

MARCH 18, 1963

Superintendents Memorandum No. 16

To: The Staff, Glen Canyon NRA

Subject: Boat Operations and Dispatching

1. The Glen Canyon Boating Manual has been completed and is available for the guidance of all boat operators. Copies of this manual will be distributed to trainees during the in-service training period on this subject. All safety requirements contained in the manual are mandatory.
2. An in-service training course covering rules of the road and other phases of small boat handling will be given for all persons expected to operate boats. After a checkout in the type of craft he will be handling each individual will be issued an area license for the type of boat he is qualified to operate. Except in dire emergencies no operator will exceed the limitations imposed by his license.
3. Mooring buoys, area boundary buoys, channel and obstruction markers and docks will be installed and maintained by the Buildings and Utilities Division.
4. All boat ramps will be maintained by the Roads and Trails Division.
5. The Boat Operations Branch with dispatching facilities and functions will be maintained by the Chief Ranger.
 - a. All boats and self-propelled barges will be numbered by extension of the present numbering system.
 - b. Each trip must be scheduled as far in advance as possible, cleared with the dispatcher and noted on the dispatching board. Itinerary and intended time of return must be noted. Upon return, check in with the dispatcher, clear the board and report any needed boat repairs.
 - c. The Protection Division is to make periodic inspections of safety equipment and general condition of each craft. If ruled unsafe or unseaworthy for any reason any boat will be taken out of service and so shown on the dispatching board until corrective action has been taken.
 - d. The Dispatcher will coordinate and consolidate trips in the interests of economy and efficiency.
 - e. In emergencies and to facilitate the overall operation the dispatcher may divert from its intended course any enroute craft if such action is justified.

610. Safety in Boating Operations

610.1 General

The firm insistence that all operations in Glen Canyon National Recreation Area be carried out in a safe manner is here again emphasized. The reasons for this insistence should be clear to each employee. There are many different cause factors for accidents. Carelessness is not one of them. Accidents may be caused, however, by (1) failure to recognize hazards and risks (2) unintentional interruptions of orderly processes (3) intentional disregard of recognized safety practices. It is recognized that it would be impractical to set down hard and fast rules for all the situations encountered in our boating operations. There are incorporated in this manual suggestions and guidelines which indicate the principles of good safety practices in handling boats. There are also included specific safety instructions that must be strictly and continually adhered to by all employees concerned.

610.2 Responsibility for Safety on Boat Patrols

Safety responsibility is firmly established in the Departmental Manual as quoted in the following:

Accident prevention is an inherent responsibility of each employee. He is responsible for reporting accidents and injuries promptly to his supervisor; and for insuring his own job safety and, wherever possible, that of his colleagues. He observes all safety precautions and adheres to all written and oral safety instructions (from Departmental Manual).

It is a part of the over-all responsibility of supervisors to see that prescribed safety precautions and instructions are observed in their work areas. Supervisors are responsible for training their employees to work safely, correcting unsafe acts and unsafe conditions, investigating and reporting all accidents and taking other actions necessary to insure safety and the protection of property (from Departmental Manual).

It is recognized by our employees that boat patrols, as well as many other operations, are carried out to best advantage and with most efficiency when there is overall supervision carried out by one member of the party. Usually this position is apparent from the organizational line or lay designation. In matters of safety, as with other required responsibilities, the man in this position must be recognized in authority by each patrol member and by any other person included in the trip. He must be alert to anticipate and control any unsafe acts or conditions.

610.3 Authorized Personnel in Boats

Only the Superintendent, Acting Superintendent and Chief Ranger may authorize other than routine boat patrols and persons, other than qualified boat operators, to be transported in official boats. District Rangers and Division foremen will schedule routine trips through the Branch of Boat Operations procedure.

610.4 Minimum Personnel on Boat Patrols and Trips

While it is desirable to have more than one man on routine and other boat trips, our staffing does not always permit. One man crews are authorized on the lake when adverse weather conditions are not prevailing and when the duty is not of such order that a one-man operation would be dangerous or inefficient. Clearance must be received from the Branch of Boat Operations when one-man patrols are contemplated.

Except under emergency conditions, no less than a two man crew will be authorized for operations on the Colorado River when it is flowing at velocities greater than 1,000 cfs.

610.5 Lifesaving Devices and Emergency Equipment

610.51 Buoyant Jackets

No official boat shall be operated on the waters of Glen Canyon without one buoyant jacket for each passenger and at least one additional on board as a spare. At any time on the water a life may be dependent upon such a jacket and its condition. Jackets shall not be used for any purpose other than that for which they are intended and shall not be tossed around or otherwise mistreated. They shall be thoroughly cleaned and dried before being stored in the designated location.

610.52 Wearing of Buoyant Jackets

While it is not mandatory for personnel in official boats to wear buoyant jackets at all times while afloat, it shall be the duty of the operator to determine when conditions justify or require the wearing of jackets by all passengers including himself. Operators will be held responsible for this duty and they are advised that retention of their operator's rating and grading in their annual performance rating will depend upon their judgement in this matter. Attention is called to the sensible demands of passengers donning a jacket during passage through rough seas, at night and during any potentially dangerous operation. Conditions requiring the wearing of a jacket when a sole operator, without passengers, is in a craft may be somewhat less severe than they otherwise would be with others present. No personnel shall work over the side of the larger craft without wearing a jacket and a safety line.

610.53 Buoyant Cushions

Each boat is supplied with several buoyant cushions normally used to sit on during cruises. They are, in this way, readily available in emergencies and should be treated as emergency equipment. If such a cushion is needed in an emergency it should never be worn on a person's back as it will force his face forward into the water. They are not recommended for children or non-swimmers. Cushions shall not be used for boat fenders or otherwise mistreated and shall be thoroughly dried and stowed as a life preserver.

610.54 Ring Life Buoys

All official craft are provided with ring life buoys stowed in brackets topsides. Approximately 60 feet of line is attached to each buoy. All craft are equipped with 15 inch throwing buoys while the larger boats have, in addition, 20 inch or larger as part of their emergency equipment.

610.55 Fire Extinguishers

Fire extinguishers are provided for each boat as follows:

- 14 foot class - One 4 lb. dry chemical aft
- 17 foot class - Two 4 lb. dry chemical, fwd and aft
One 2½ gallon foam, midships
- 19 foot class - One 4 lb. dry chemical, forward
One 5 lb. CO₂, aft
One 2½ gallon foam, midships
- 34 foot class - To be determined
- 56 foot class - To be determined

These extinguishers shall be included in the regular semi annual extinguisher inspection program of the area. Following any discharge, accidental or intentional, the fact will be reported to the Branch of Boat Operations at the earliest possible time so recharge can be accomplished.

610.56 Emergency Boating Equipment, General

The purpose and nature of our boating patrols require selected equipment be available to effectively handle any emergency that can be anticipated. A minimum equipment list has been made for each boat and the equipment supplied. While some of this gear may be considered as not of a strictly emergency nature and may be used for routine purposes while on patrol, it is imperative that it be considered as part of the boat kit and not be separated from it. Any breakage, depletion or loss of equipment assigned to a boat shall be reported to the Chief Ranger immediately upon return from a patrol. All equipment assigned a boat will be marked so as to identify it with a particular boat. Although regularly scheduled equipment checks will be made to ascertain condition and presence of equipment, it is an individual responsibility to see that none is permanently removed or transferred without authorization.

610.57 Emergency Equipment Lists

The following lists indicate minimum equipment for each patrol boat. A copy of the applicable list will be posted in each boat, and assigned personnel will inspect the equipment for condition and presence once each month, or following each patrol, whichever is the more frequent.

2	Tarps, emergency	2	Water bags, canvas
8	Ponchos	2	Flashlights, 6 volt
4	USFS Rations	1	Coil, Rope
1	Notebook, 6 hole	1	Bilge pump
1	Pad, paper	6	Ft. of gas hose
4	Pencils	2	Pc. Aluminum sheeting
1	Bucket, canvas	1	Roll Toilet Paper
1	Hatchet	1	Equip. Data Book
1	Box, Marine flares	1	Nozzle, Jeep can
1	Snake-bite Kit	8	Spare Batteries, flashlight
1	Pr. Binoculars, 6 X 30	1	Tube, Gasket Goo
1	Tube, Lubri-plate		

TOOL BOX

1	Drill, hand	3	Screwdrivers, Phillips head
1	Set, Drills	1	Screwdriver, Angle
1	Set, Punches	1	Screwdriver, Split tip
1	Set, Open end wrenches	2	Pr. Vise Grips
1	Set, Sockets, $\frac{1}{4}$ " drive	1	Pr. Normal Pliers
1	Set, Handles for above	1	Pr. Needle Nose pliers
2	Jeweler's screwdrivers	1	Pr. Comb. Diag. pliers
1	Pr. Tin Snips	1	8" Crescent Wrench
1	Hacksaw w/blades	1	Pocket Knife
1	Stone, Axe-sharpening	1	Set, Swiss files
4	Sparkplugs	1	Bx. Assorted cotter pins
1	Marlin Spike	1	Bx. $\frac{1}{2}$ " X 10 sheet metal screws
1	Ball Peen Hammer	2	Bx. @SFE 4 & 20 Amp fuses
1	Claw Hammer	2	Gasoline hose tips
1	Set, Sockets 3/8" drive	1	Electrician's scissors
1	Set, Handles for above	1	Roll Elec. Wire, Approx. 15'
1	10" File	1	Roll Elec. Tape
1	Heavy Duty Screwdriver	1	Awl
3	Screwdrivers, Normal		

Additional Materials in Boat

2	Boat Hooks, aluminum/wood	6	Life Jackets
1	Shovel, Lady	6	Buoyant Seat Cushions
2	Mooring Lines, light	1	Life ring, w/line
1	Mooring line, heavy	6	Fenders
2	Spare props	1	5lb. CO ₂ Extinguisher
1	4 lb. Dry Chemical Ext.	6	1-cell Life lights
2	Cruise-a-Day 6 gal Tanks	1	First Aid Kit

611. DESCRIPTION OF NPS BOATS IN GLEN CANYON NRA FLEET

611.10 Fourteen Foot Patrol Boats (141) (142)

Type: Outboard Runabout
Power: One 18 hp outboard engine
Tradename: Aero-Craft
Manufacturer: Harwill Inc. St. Charles, Michigan
Hull: Aluminum, Riveted Seams
Keel: Aluminum, Stringers and spray rails riveted to hull
Flotation: Styrofoam under seats
Accessories: Bow and stern handles, running and stern lights

Overall length: 13' 9"
Max. Beam 4' 7"
Midship depth: 18"
Transom height: 15"
Weight: 150 pounds
Gas tank: one six gallon Evinrude Cruise-A-Day

Loading Capacity, 14 foot Boats

The manufacturer states that this boat was designed for four persons or 600 pounds. Experience indicates that for our operational purposes these boats should not be loaded to exceed:

2 passengers (including operator) + minimum cargo

3 passengers (including operator) + no cargo

Caution must be exercised in the loading and use of these small craft as they are easily overloaded and easily capsized if rough water is encountered or unwise use made of the engine.

611.11 Seventeen Foot Patrol Boat #171

Type: Outboard runabout

Power: Two 35 hp outboard engines

Tradename: Smithcraft

Manufacturer: Seth Smith Boat Works, Phoenix, Ariz.

Hull: .064 tempered aluminum, welded seams

Decks: 3/8 inch vinyls covered plywood

Keel: extruded aluminum, stringers and spray rails
riveted to hull

Flotation: Styrofoam

Accessories: Transom drain plug, bow handle, bow
and stern eyes, steering wheel,
remote control gear shifts and throttles,
windshield, rear view mirror, chocks
and cleats, radio, spotlight, siren,
horn.

Overall length: 17 feet Transom depth: 23 inches

Max. beam: 80 inches Transom height: 16 inches

Transom beam: 63 inches weight: 600 lbs. w/o motors

Midship depth: 32 inches

Gas tanks: Built in tanks under stern seat

Gas capacity, 13 gallons each tank, total 26 gallons

Loading Capacity, 17 foot boat

The manufacturer states that this boat was designed for six passengers plus gear for cruising. Our experiences have found that the boat is somewhat overloaded with five passengers and a moderate amount of camp gear. It is directed that except in extreme emergencies the operational loading of this boat shall not exceed:

5 passengers (including operator) + minimum cargo

4 passengers (including operator) + 200 lbs cargo

Cargo may be increased proportionately with a decrease in the number of passengers but not to such an extent as to endanger the stability of the craft on open water.

611.12 Nineteen Foot Patrol Boat #191

Type: Outboard runabout
Power: Two 40 hp outboard engines

Tradename: Smithcraft
Manufacturer: Seth Smith Boat Works, Phoenix, Ariz.

Hull: .064 tempered aluminum welded seams
Decks: 3/8 inch vinyl covered plywood
Keel: extruded aluminum, stringers and spray rails riveted to hull
Flotation: Styrofoam

Accessories: Transom drain plug, bow handle, bow and stern eyes, remote control gear shifts and throttles, windshield, rear view mirror, running lights, remote steering controls, chocks and cleats, spotlight, radio, cabin, magnetic compass, horn, siren, tachometer.
Electrical starting from remote control on 12 volt batteries. Generator on each motor to handle power load.

Overall length: 18 feet 5 inches
Max. beam: 92 inches
Transom beam: 63 inches
Bow depth: 44 inches

Deck length: 68 inches
Transom height: 21 inches
Transom depth: 27 inches
Weight: Without motors 800 pounds

Gas tanks: Built in under stern deck with outboard vents and filler caps.

Gas capacity: 18 gallons each tank: Total 36 gallons

611.13 Nineteen Foot Patrol Boats (192) (193) (194)

Type: Inboard-Outboard runabout.
Power: Graymarine 160 hp V8 automotive type engines
with closed cooling system.
Tradename: Smithcraft
Manufacturer: Seth Smith Boat Works, Phoenix, Ariz.
Hull: .064 tempered aluminum, welded seams
Decks: 3/8 inch vinyl covered plywood
Keel: Extruded aluminum, stringers and spray rails
riveted to hull.
Flotation: Styrofoam

Accessories: Transom drain plug, bow handle, bow and
stern eyes, remote control gear shifts
and throttles, cabin, rear view mirror,
running lights, remote steering controls,
chocks and cleats, radio, depth finder,
spotlight, magnetic compass, horn, siren,
tachometer, hour meter.

Electric starting from remote control on 12 volt battery.

Overall length:	18 feet 5 inches	Deck length:	68 inches
Max. beam:	92 inches	Transom height:	21 inches
Transom beam:	63 inches	Transom depth:	27 inches
Bow depth:	37 inches	Weight without motor	800 lbs
Midship depth:	37 inches	Drive unit	180 pounds
		Motor approx.	390 pounds

Gas tanks: Built in under midship seats with
outboard vents and filler caps.
Gas Capacity: 18 gallons each tank. Total 36 gallons

Loading Capacity - Nineteen Foot Boats

The manufacturer states that this boat is designed
for eight adult passengers. Experience indicates that
for our operational purposes these boats should not
be loaded to exceed:

7 passengers (including operator) + Minimum cargo
6 passengers (including operator) * light cargo
5 passengers (including operator) * 200lbs cargo

Cargo may be increased proportionately with a decrease
in the number of passengers but not to such an extent
to endanger the stability of the craft on open water.

611.15 Twenty Four Foot Floating Ranger Station

Type: Houseboat

Power: 18hp Evinrude

Manufacturer: Holiday Boat Co., Vicksburg, Miss.

Hull: 12 guage steel, welded seams, 24 x 8 feet
24 inches deep.

Decks: Steel

Flotation: Watertight compartments.

Accessories: five pound dry chemical extinguisher,
mooring cleats, evaporative cooler,
bilge pump, bilge blower, running
lights, 2-KW gasoline power plant,
anchor and anchor line, horn and
spotlight.

Electric starting from remote control on 12 volt
battery.

Access Hatches are provided of sufficient size to
allow an average man to enter the bilge area.

611.20 Thirty-four Foot Cruiser # 341

612. Marine Propulsion Engines

612.11 General

In our boating operations we will be concerned with the use of two types of internal combustion engines. The two types of engines are gasoline and diesel.

The gasoline engines are further divided into two basic types by the number of strokes the piston makes in each power cycle. Those engines operating on a 2-stroke cycle (commonly known as "2-cycle") and those operating on a 4-stroke cycle (4-cycle). The principle difference is that the 2-cycle engine fires every time the piston reaches the top of its stroke; while the 4-cycle engine fires every other time the piston reaches the top of the stroke. (top of the stroke being the position of the piston farthest from the crankshaft) Another basic difference is in the method of lubrication. In a 4-cycle engine, lubricating oil is carried in the crankcase and clear gasoline is used as fuel. In the 2-cycle engine, oil is mixed with gasoline for fuel and lubrication.

Our Evinrude outboard motors and the Greymarine diesels are examples of a 2-cycle engine, while the Graymarine gasoline powered engines are of the 4-cycle type.

The diesel engines in use are manufactured by General Motors Corporation and sold under the tradename of Graymarine. These motors are 2-cycle, a design used to lower the power to weight ratio. These engines differ from the 2-cycle gasoline engines in that the lubricating oil is not mixed with the fuel. The diesel engine is lubricated and fueled in much the same manner as the 4-cycle gasoline engine. Spark plugs are not used in a diesel engine, high temperatures and pressures in the cylinder of a diesel combine to ignite the fuel upon injection into the cylinder. The fuel injection into the cylinder is synchronized with piston travel, much the same as the spark is timed in a gasoline engine. Proper timing of the fuel injection system in a diesel engine is just as important to its operation as timing of the ignition system is to a gasoline engine.

612.12 Outboard Motors

Outboard motors are widely recognized and popular propulsion units for watercraft. The designation "outboard motor" comes from the fact they are mounted

outboard or outside the transom or stern of a boat. It distinguishes them from the inboard engine mounted within the boat hull and driving the propeller by an extended drive shaft. Outboard motors are not recent inventions; the Evinrude Company lists them as far back as 1909, (1½ horsepower 110). The spectacular improvements in outboard motors in recent years has resulted in increased power, efficiency and, most particularly, reliability. This last factor is probably a major cause for the soaring popularity of recreation boating in small craft. These advancements along with the conveniences added to recent designs have, however, brought us from the small, lightweight motors of yesterday to our present giant models of considerable weight. The popular outboard motor is no longer a truly portable one although small models are still available. Our 40 horsepower Evinrude weighs about 150 pounds; 75 horsepower units about 225 pounds. This increased power and weight has led directly to a great increase in boating accidents. The public demand for more and more horsepower, and the manufacturers' ability to produce it, are resulting in the overloading and overpowering of many small craft increasing the attendant danger. Conscientious boat manufacturers and organizations such as the Outboard Boating Club of America are making a concerted effort to design and match boats and motors safely. A great many amateur boaters disregard, or fail to recognize the potential dangers of overload, overpowered boats. The boats and motors used in our operations have been selected to be well mated within the prescribed safety limits.

The Colorado River downstream from Glen Canyon Dam and the small inlets on Lake Powell will be favorable for the use of outboard motor-powered boats. As our administrative activity expands on Lake Powell, larger patrol craft powered with inboard engines will be added to our fleet. They will not, however, entirely replace the outboard boats. The latter will continue to be assigned for local patrols, maintenance and other day to day operations not requiring larger craft.

612.13 Inboard Engines

The term "inboard motor" is derived from the fact that the engine is mounted inside the hull and drives the boat by various means of drive shafts to the outside.

With the public demand for more horsepower and recent improvement in inboard engines and drives, the inboard engine is becoming even more popular. The use of aluminum casting has done much to reduce the horsepower to weight ratio of the

inboard engine, thus making it a suitable power plant for small and faster boats. Successful developments in the field of outboard drive units and inboard jet units for the inboard engine have made this installation popular for use in shallow water operations. The concept of inboard power with outboard maneuverability also lends to the popularity of this design.

In our operations, the inboard-outboard unit has proven to be quite successful. Our present records indicate that the inboard-outboard combinations in use have given better performance and economy of operation, than a comparable outboard motor installation.

Unofficially, our use of jet units is not contemplated, at least at their present state of development. The present jet units operate most efficiently only at high speeds, whereas the outboard unit has a wide range of efficiency. In as much as most of our patrol work will involve speeds considerably less than top speed, the outboard drive unit seems most practical to use for our boating operations.

Diesel engines are in use on the larger boats such as the ICM and 31 foot cruiser. In these larger craft, the weight of the diesel engine is secondary to the fuel economy it provides. It has been estimated that the fuel cost for operation of a diesel powered craft is almost one-half that of a similar craft powered by gasoline engines. It is very likely in the future that smaller and smaller boats will be using diesel engines as the horsepower to weight ratio of these engines is reduced through improvement in design and construction.

612.14 Marine Engines, Requirements for in Glen Canyon NRA

Present and future official boating make it absolutely necessary that those employees operating boats be thoroughly familiar with the engines of each. Operational procedures, reasonable knowledge of the mechanics of the engines, trouble shooting, and minor repairing must be understood by each operator. Additionally, emergency assistance to public boaters will be a constant demand on all waterborne employees. A knowledge of engines and the ability to get them running in the case of minor failures will expedite our operations as well as assist the visitor. Instruction manuals as well as other pertinent literature are available for study. Although instruction in the various phases of boating will be included in training programs, each employee assignable to the operation of the boats is strongly encouraged to study on his own so that

he will become fully competent with the engines. There is a short bibliography attached to this manual. (See Sec. 631.)

612.15 Service Manuals

Service manuals and descriptive literature are available at headquarters. An "owner's Manual" is included in each boat box and you will find it useful in explaining routine operation and maintenance.

612.16 Operating Records

Cost accounting, maintenance schedules and other administrative data require the keeping of an operating log of each motor. The employee assigned a boat for patrol or other purpose will be responsible for logging the operating time of each motor along with such other pertinent data as fuel and oil drawn, service, damage and repair. The Maintenance Division will be responsible for logging major servicing and repairs made in the shop. A log book will be kept in each boat for such purpose.

612.20 Description of Marine Engines, Glen Canyon NRA

612.21 Diesel Engines

As these engines are complicated and unfamiliar to the average person, a detailed description will not be given in this manual. It is recommended that anyone intending to operate a diesel engine become thoroughly familiar with the complete unit through use of the instruction manual. He should completely understand the information supplied in the instruction manual before attempting any maintenance or service operations.

612.22 3¹/₂ Foot Cruiser Diesel Engine

612.23 160 HP. Graymarine V8 Model V8A-160

The 160 horsepower Graymarine V8 inboard engine is coupled with a MerCruiser stern drive unit to power the 19 foot patrol boats, 192, 193, 194

Starting & Stopping: Electrical by remote control to the dashboard.

Generator: 12 volt alternator (40 amps)

Battery: 12 volt under starboard-stern seat

Ammeter: Combination type that indicates generator performance and battery condition on dash.

Heat Gage: Indicates engine temperature in degrees. Located on dashboard.

Tachometer: On dashboard, indicates RPM of engine.

Steering: Remote control to steering wheel by ring gear and push-pull system

Throttles: Remote control to cockpit

Gear shift: Forward-Reverse-Neutral remote control in cockpit.

Choke: Automatic

Fuel Jets: Interchangeable in different sizes

Carburetor: Four barrel

Oil pressure: Indicated by gage mounted on dashboard.

Cooling system: The engine is fresh water cooled, with fresh water circulated by a centrifugal pump through a closed circuit, and rejected heat is conducted away by sea water piped through a heat exchanger.

612.24 Outboard Engines, General

Government-owned outboardsmotors now used in Glen Canyon NRA are units manufactured by Evinrude Motors of Milwaukee, Wisconsin. It is interesting to note - and to file mentally for future use - that engine parts of Evinrude and Johnson motors are interchangeable in recent models. The following outboard motors are included in our existing boating equipment:

<u>MANUFACTURER</u>	<u>HP</u>	<u>MODEL NO. & NAME</u>	<u>YEAR</u>
Evinrude	40	40352 Big Twin Electric	1963
Evinrude	35	35012 Big Twin	1959
Evinrude	30	25022 Big Twin	1956
Evinrude	18	Fast Twin	1962
Evinrude	10	4398 Light Four Heavy Duty	1945

612.25 40 Horsepower Evinrude "Big Twin Electric"

The 40 horsepower Big Twin Electrics are normally used to power the 19 foot patrol boat (191) with a twin (dual) mounting. A general description of them follows.

Starting: Electrical, by remote control to dashboard
Manual control on motors.

Generator: 12 volt on starboard and port engines

Battery: 12 volt under forward seat

Ammeter: Indicates generator performance on dash.

Motor Heat Light: Indicates overheating of engines
by a warning light on dashboard

Tachometer: On dashboard to indicate motor revolutions
and synchronization

Steering: Remote control by cable and pulley system.
Emergency tiller may be attached to motor.

Throttles: Remote control to cockpit and manual local
control on motors.

Gear Shift: Forward-Reverse-Neutral remote control in
cockpit and manual local control on motors.

Choke: Automatic and manual on motors

Fuel Jets: Fixed type

Fuses: In fuse box near stern seat

612.26 35 Horsepower Evinrude "Big Twin"

The 35 horsepower Big Twin is normally used in a twin (dual) mounting on the 17 foot patrol boat. These engines are equipped as follows:

Starting and Stopping: Local manual controls on
motors only.

Generator: None

Steering: Remote control to cockpit and manual
local controls on motors.

Gear Shifts: Forward-Reverse-Neutral remote control
in cockpit and local manual on motors

Choke: Manual on motors

Fuel Jets; Adjustable on motors

Fuses: None.

612.27 30 Horsepower Evinrude "Big Twin"

A 30 Horsepower Big Twin is available among our equipment and this engine will normally be used as a spare, to move barges or as otherwise assigned. It is equipped like the 35 hp engines and could be hooked into the remote control system of the 17 foot patrol boat if needed.

612.28 18 Horsepower Evinrude "Fast Twin"

The 18 hp Evinrude "Fastwin" as normally used on the 14 foot patrol boats, the starting, stopping, throttling and gear shifting is done by local manual controls on the motors.

This engine is also used to propel the floating 24 foot ranger station. As used in this installation, starting, stopping, throttling, and gear shifting is done through the use of mechanical controls located at the forward end of the cabin.

Choke: Manual on motors
Fuel Jets: Adjustable on motors
Fuses: None

612.29 10 Horsepower Evinrude "Light Four"

10 horsepower Evinrude engines have been secured from the U.S. Navy. These are heavy duty, four cylinder engines that have been acquired for local work in harbors and where they are otherwise suitable. These motors are long-shafted models with larger propellers making them unsuitable for our Patrol boats. They will all be locally controlled from the motor.

613.8 Safety Instructions for Fueling Operations

Gasoline is always an extremely hazardous material. It has become so commonplace in our everyday lives we sometimes forget or disregard its highly combustible character. The very nature of boats and boating activities make it a dangerous fuel for marine use, although a necessary one. Gasoline must be given the greatest respect by each of our employees and each operation requiring its use must be deliberately thought out and carried out. The following directives are issued to be followed by every employee involved in boating activities:

613.81 Time of Fueling

1. Fueling shall be completed before dark except in emergencies. Anticipate your fueling needs.

613.82 Land Fueling Operations (boat usually on trailer)

1. Ignition of towing vehicle shall be off so that all equipment including radio is inoperative.
2. Ascertain that there are no smoking, sparks, flames or devices liable to produce flame and spark in the vicinity.
3. Remain alert to actions of others in the vicinity.
4. Check condition of fuel tank vents and connections.
5. Ascertain approximately how much fuel is needed.
6. Keep nozzle of gasoline supply hose in contact with fuel fill opening to guard against static sparks.
7. Exercise all caution to prevent overflow of tanks.
8. Close tightly all fill openings.
9. Wipe up all spilled gas immediately.
10. Properly dispose of all gasoline or oil soaked rags.

613.83 Afloat Fueling Operations (Two Methods)

Transfer of Fuel from Reserve Tanks

This operation is that of transferring the fuel supply from the regular fuel tanks to the six gallon reserve Cruise-A-Day tanks. The operation is a simple, fast one and relatively safe if reasonable precautions are taken:

1. The motor receiving the fuel line transfer shall not be running during the operation.
2. There shall be no smoking or other exposed flames in the boat.
3. The fuel line from the reserve tank being transferred should not be primed until the engine connection is completed.
4. Disconnect of the one fuel line and connect of the second should be made with positive motions and with the connector points correctly oriented and aligned so there can be no discharge from the connector before it is seated.
5. A check shall be made of the fuel line connections and fuel line to determine leaks while priming and after engine is running.

Fueling Regular or Reserve Tanks from Spare Supplies

This operation consists of filling the regular or reserve tanks from any fuel source (GI cans, transfer pump, etc.) while afloat. This is a dangerous operation and the following safety rules must be rigidly adhered to:

1. Under no circumstances shall these fueling operations be attempted while either engine is running.
2. Unless circumstances permit refueling in otherwise absolute safety, or in emergencies, the boat should be beached for refueling of the tanks.
3. No smoking will be permitted in or around the boat while refueling. Notify all in immediate vicinity you are about to refuel, and remain alert to actions of those nearby.

613. Fuels and Fueling

613.10 Fuel Tanks

34 Foot Cruiser

613.10 Fuel Tanks

24 Foot Floating Ranger Station

Gas Tank: Built in at stern of boat with outboard filler caps and vents.

Capacity: 40 gallons

19 Foot Patrol boats (192-3-4)

Gas Tanks: Two built in tanks under midship seats with outboard filler caps and outboard vents.

Capacity: 18 gallons each tank. Total 36 gallons.

19 Foot Patrol Boat (191)

Gas Tanks: Two built in tanks under stern deck with outboard filler caps and outboard vents.

Capacity: 18 gallons each tank. Total 36 gallons.

Reserve tanks: Two six gallon Evinrude Cruise-A-Day tanks complete with fuel lines.

17 Foot Patrol Boat (171)

Gas Tanks: Two built in under stern seat with filler cap on top of each tank. Cap wrench kept on hanger in the tank compartment.

Capacity: 13 gallons each tank. Total 26 gallons

Reserve Tanks: Two six gallon Evinrude Cruise-ADay complete with fuel lines.

613.11 Reserve Fuel Tanks

In addition to the built-in fuel tanks, boats 171 and 191 are supplied with two Evinrude Cruise-A-Day tanks of six gallons reserve fuel each. These auxiliary tanks have been provided as a safety factor as well as for convenience since they permit an extended fuel supply without attempting to fill the the main tank while the boat is waterborne. Fuel supply lines are supplied with each tank and they are designed with quick couplings on the tank and motor connections. A priming bulb is provided in the fuel line. The supply system will not operate unless the line is properly oriented to the

motor and tank. The direction of the fuel flow to the motor from the tank is clearly indicated on the flexible line by an arrow, and the connection must be made in this manner.

613.12 Fuel Caches

Pending the completion of development sites on Lake Powell, fuel caches will be established at various locations on the lake shore. Any depletion of these caches must be reported to the Chief Ranger immediately upon return from a patrol, so the deficiency can be reckoned in emergency patrols, and so replenishment can be arranged.

613.13 Fuel for Marine Engines

Outboard Engines

The outboard motor is a two cycle engine. The lubrication of pistons, cylinders, crankshaft and connecting rod bearings is supplied solely by oil, which is mixed with the gasoline before it is placed in the tanks. In our operations regular automotive gasoline is used. White gas, marine gas or high octane fuel may be used in an emergency when necessary. The boats, reserve tanks and caches are supplied from our regular equipment fueling pumps.

Inboard Graymarine Engines, Gasoline

These engines will operate satisfactorily on regular automotive gasolines. Either regular, ethyl or premium ethyl gasolines of 90 octane minimum may be used. The use of white gasoline is not recommended for use in these engines.

Inboard Engines, Diesel

The boats, reserve tanks and caches are supplied from our regular equipment fueling pumps. Either No. 1 or No. 2 grade diesel fuel may be used. No. 2 grade diesel fuel is the standard grade used throughout the area and in these engines.

613.14 Lubricant for Marine Engines

Outboard Engines

See 30 Outboard Motor Oil is used in the fuel mixture for our outboard engines. A supply of this oil is maintained at headquarters, in each boat and in the fuel caches. In case of an emergency and when impossible to secure this oil, regular SAE 30 automotive

oil may be used. It is not advisable to do so if it can at all be avoided.

Fuel-Lubricant Mixing Instructions, Outboard Engines

The correct fuel-lubricant mixture is:

- 1/3 pint of oil to 1 gallon of gasoline
- 1 pint of oil to 3 gallons of gasoline
- 1 quart of oil to 6 gallons of gasoline
- 2 quarts of oil to 12 gallons of gasoline

It is recommended that only fresh gasoline-lubricant mixtures be used. For this reason reserve or cached fuel should not be kept with mixtures already made up if they are to stand a considerable length of time. In filling empty tanks, it is best that about 1 gallon of gasoline be put in the tank first, then followed with the proper amount of oil and full filling of fuel. In adding fuel to a partially empty tank, oil must be added in the correct proportion for the amount of replenishing fuel. All reserve or spare cans should be plainly marked with tags to indicate whether fuel contains oil or is straight.

Inboard Graymarine Engines, Gasoline

A good grade of automotive type SAE 20 oil is standard for these engines.

Inboard Graymarine Engines, Diesel

RPM Supercharged Delo SAE 30 is used in these engines. All diesel engines in the area use this brand and grade of lubricating oil.

613.15 Fuel Consumption

Fuel consumption of marine engines is most practically measured in gallons of fuel consumed in an hour of engine operation (gallons per hour). The rate of fuel consumption by an engine is not a constant one and depends upon several factors. The effective distance travelled by the boat in the unit of time also depends upon several factors. Some of these factors are:

1. Operating speed (RPM)
2. Condition of engine
3. Design of hull and its condition
4. Displacement (weight of boat, passengers and cargo)
5. Placement of load in boat (trim)
6. Water conditions (waves, current, wind, etc.)

Varying conditions of operations thus far, have not provided us with sufficient data to produce fuel consumption tables for marine engines. Experience with

outboards, indicate that for average operation conditions at about 2/3 throttle, we can expect a fuel consumption rate of 3.5 gallons per hour per engine. There appears to be no appreciable difference between the 35 hp and 40 hp outboard engines. It is obvious that the required amount of fuel depends upon the number of operating hours required to go the planned distance. For example, under the wide variance of lake conditions, the operating time required to go from Wahweap to Hite may vary by as much as 5 hours. Always try to carry enough fuel reserve to meet unexpected conditions that may develop. Patrol boats should always start with full main and reserve tanks of fuel. Extended patrol will require further fuelling arrangements.

613.16 Fuel Consumption - Rules of Thumb

Gasoline - 4 cycle engines

1 gallon fuel per hour per each 12 or 13 horsepower used.

Diesel

0.41 pounds of diesel fuel consumed per brake horsepower per hour.

7.2 pounds equals 1 gallon of diesel fuel

Hourly consumption equal $\frac{0.41 \text{ lbs} \times \text{horsepower used}}{7.2 \text{ (lbs.)}}$

614. Care of Boats and Related Equipment

Knowledge of the character of our boating activities and recognition of the part fine equipment takes in carrying out efficient and safe operations has guided us in selecting and obtaining the best boats, engines and marine gear that we believe is available for our purposes. The investment in government funds in this equipment is a sizeable one. This fact, alone, is a basic and sufficient reason for insistence that all this equipment (as well as other government property) be operated and used in a responsible manner. In addition, our boats and related equipment are vital units in emergency operations, although they may be commonly assigned to more routine duties. They must be maintained in top condition and fully equipped for immediate use in protection activities. Your safety as well as that of others may depend on the condition of your boat. Preventative maintenance, good judgement and pride will go a long way in keeping our fleet shipshape and up to Glen Canyon standards. Your part in caring for a boat will not be a difficult or arduous task; we hope you will find it a pleasant part of your job. Certainly, some of it will require learning, particularly if you are not familiar with boats or local policy. Much of it will be your exercise of common sense, alertness and willingness to conform. The details of good seamanship, or if you would prefer to call it boatmanship, are too numerous and lengthy to publish in this manual. The following checklist is not set down here as a precise inspection form. It is included to bring to attention some of the conditions you are expected to keep aware of whenever assigned boating duties. It should be evident which deficiencies would require your immediate attention to correct and which may need submission of a report so shop time can be scheduled.

614.1 Boat Condition Check List

Hull and Decks

Cleanliness and Appearance

1. Free of oil and grease?
2. Need washing down and polishing?

Condition

1. Paint in good shape?
2. Dents, major ones present?
3. Rips or tears in skin?
4. Chrome, loose strips or fittings?
5. Rivets, missing or loose ones?
6. Screws, missing or loose ones?
7. Any leaks?
8. Transom in good condition?
9. Deck covering torn?

Interior

Cleanliness and Appearance

1. Free of grease and oil?
2. Loose dirt?
3. Need washing down?

Condition

1. Woodwork finish in good shape? Varnish?
2. Woodwork in good shape? Split or cracked?
3. Screws, loose or missing?
4. Minor repairs needed? Major ones?
5. Fittings in good shape? Need polish?
6. Instruments working properly?
7. Seat coverings torn?
8. Bilges clean?
9. Lights?

Safety

1. Steering gear working properly? Tight?
2. Remote throttles working properly?
3. Remote gear shift working properly?
4. Fuel tank well clean? Unauthorized stowage?
Strong gas fumes? Tank leaks?
5. Running lights bright (operative)?
6. Repairs needed to any equipment?
7. Oil rags or waste?
8. Spare propeller and drive pins present?

Equipment

1. Complement of gear present (check list)?
2. Condition of gear? Broken? Rusty? Needs overhaul?
3. Stowage of gear shipshape?
4. Manilla lines? All present? Condition? Need replacing?
5. Lifejackets, Complement present? Condition?
6. Emergency signal equipment present?

Motors

Condition

1. Clean exteriors? Excess oil and grease?
2. Excessive oil leaks indicated?
3. Engine shell damaged?
4. Propellers bent or otherwise damaged?
5. Excessive shaft play?
6. Starter ropes frayed or broken?
7. Spare spark plugs on hand?
8. Start easily?
9. Tuned up?
10. Excessive fuel consumption?
11. Lower unit checked?
12. Lubrication current?

Operation

1. Unusual noises in operation?
2. Motor heating excessively?
3. Fuel hose connections leaking?
4. Excessive or unusual vibrations?
5. Starting difficult?
6. Idles properly?
7. Excessive exhaust?
8. Generator charging properly? Batteries up?
9. Motors tight on transom? Safety wire in place?

615. Boat Trailers and Trailering

615.1 General

Trailers for land transportation of the 17 and 19 foot patrol boats are included in the Glen Canyon boating equipment. Although different in size, the trailers are each of the lift frame design and, except for a few minor variations, operate similarly. Loading, launching and towing require practice to obtain proficiency. While one man can perform the operations of loading and launching a boat with these trailers, two men make the job much easier and with increased safety. Two men, except for very unusual circumstances, will be available for the operation. Certain fundamentals of trailering have been included in this section for your guidance and as safety directives.

615.2 Towing Boat Trailers

1. The towing hitch ball on Glen Canyon vehicles is standardized as the 2 inch diameter size.
2. Towing vehicles must be backed carefully to close proximity of the hitch on the trailer tongue so that damage is not done to the latter or to the ball.
3. The hitch must be settled snugly on the ball and secured tightly so no excessive play will occur or the hitch jump off the ball while underway.
4. The safety chain is to be secured to towing vehicle at all times while trailer is being towed. The chain must be tight enough to prevent trailer tongue from striking ground if hitch should fail but loose enough that binding does not occur in maneuvering.
5. The forward leveling wheel of the trailer is to be raised to give sufficient road clearance. In the case of the 17 foot boat trailer, the wheel must be removed and reversed in the socket.
6. Inspect all boat tie downs to ascertain they are snug. Forward tie downs should not be exceedingly tight.

7. Inspect motors to ascertain they are in elevated position on the boat transom and are snugged to keep from shifting.
8. Inspect boat to ascertain all is secure for the road travel. Gear or equipment (other than that assigned to the boat) should not be land transported in the boat but in the towing vehicle if possible. If it must be carried in the boat attention is to be given to its distribution so that hull stresses with resulting damage do not occur. Secure gear to prevent shifting.
9. Secure boat cover.
10. Check trailer tire condition including visual inspection for proper inflation.
11. If towing at night proper running lights must be provided on the trailer.
12. Towing must be done at a speed reasonable for the road and other conditions. It must be remembered that you are towing equipment worth several thousands of dollars. The position of the motors on the boat exerts a tremendous strain on the transom under the best of conditions. Excessive bouncing or swaying of the boat and trailer will most certainly lead to hull damage. Swing wide when passing and on sharp curves. Extra momentum caused by weight of boat and trailer means you need a little more distance than usual for stopping.
13. When boat is to remain on trailer while it is parked for a considerable time the tiedowns should be eased off to reduce hull stresses.

615.3 Launching Boat from Trailer

1. Occasion will demand launching from improved, hard top ramps as well as from unimproved ones and sandy beaches. While the system of launching is the same in all cases special care must be exercised in the latter two types that you do not bog down in soft or wet material. =
2. The trailer must be backed as nearly at right angles to the shoreline as possible. Backing a trailer is a confusing maneuver until you become familiar with the operation. It requires practice. Your partner should assist in lining you up properly with the water's edge.
3. When a few feet from the water remove the tie-downs, boat cover and prepare the boat for entry into the water. Gear and equipment may be transferred from the vehicle to the boat at this point. Consider whether to lower the motors at this time or to wait depending upon the topography of the ramp. Check the motor safety cables to see that they are secure. Do not remove the winch cable from the boat at this time.
4. Back trailer into water until free launching of the boat is assured. It is well if the trailer wheel hubs are not submerged since water will dilute and otherwise damage the grease packing. Sometimes it cannot be avoided. Set vehicle brakes and keep in gear.
5. Ascertain there is a mooring line secured firmly to the bow of the boat and leading to shore in sufficient length to assure control of the floating boat. Line must be clear.
6. Operate the lever on the front end of the trailer so as to raise the keel rollers under the keel of the boat. These rollers are provided to facilitate sliding the boat from the trailer.
7. Unhook winch cable from boat if it appears safe to do so at this time. Under some conditions it may be wise to keep it hooked to boat until full flotation is achieved and boat is under full control of mooring line.

8. Boat may now be shoved down trailer until afloat or if ramp conditions require the trailer frame retaining pin may be removed and the forward end of the frame elevated to facilitate sliding the boat into the water. Make certain your mooring line is secure.
9. Moor boat safely against shore where it may be easily loaded.
10. Pull vehicle and trailer to safe parking site.

615.4 Recovering and Loading Boat on Trailer

1. Back trailer into correct alignment with water's edge at desirable loading site.
2. Maneuver boat with lines (or under power if necessary) so forward edge of keel (stem) aligns with trailer keel-channel. Steadying lines may be required from stern to shore.
3. Hand haul boat up trailer as far as possible. Keel must be kept in alignment with trailer. Attach winch cable hook to bow eye of boat.
4. Winch boat up trailer while gently rocking boat to facilitate movement. Keel must be kept in alignment.
5. If frame has been elevated, allow it to settle gently down into place and replace retaining pin.
6. Lower keel rollers into place.
7. Do not remove winch cable from boat but forward tiedown may now be secured.
8. Pull trailer and boat from water to level site.
9. Inspect mounting of boat on trailer to ascertain it is resting correctly in cradle for hauling.
10. Secure all tiedowns.
11. Elevate motors and secure properly.
12. Transfer extra gear and equipment to vehicle.
13. Check trailer hitch for security.
14. Replace boat cover and secure.

616. Mooring

616.1 General

Once the patrol craft has been launched and is fully water-borne it must be beached or otherwise moored beside the shore or dock in a safe position for the loading of passengers and equipment, for carrying out routine details, and to assure no damage is done to the boat during these activities. Although varying circumstances do not permit specific instructions, there are guidelines that should be observed in this operation as well as in all others requiring mooring or temporary beaching.

1. Bow-on beaching is not preferable to broadside or parallel mooring to the shoreline although at times it may seem the former is the more convenient. This position of the boat is conducive to loading passengers and equipment over the fore-deck, around the windshield and along the narrow gunwales. In addition to the obvious hazards to personnel safety and above-deck fixtures there is also the danger of structural damage due to the hull stresses applied while the bottom is resting on a firm bottom. At times there is no choice but to beach the boat in this manner. When it is necessary to do so and when bottom and water current conditions permit, consideration should be given to requiring passengers and cargo to be loaded over the sides even if it means wet legs from wading. Further, if the boat is loaded while bow-on a beach you must consider the problem of backing the loaded craft off the sand or mud. It can mean unloading, backing off, and reloading.

2. Make sure your boat is securely moored to immovable objects on the beach. If there is a current it is well not to consider attempting to hand-hold the craft. Currents and the resulting drag can be exceedingly deceitful. It would be embarrassing, if not dangerous, to watch your boat float away while you were standing helplessly on the beach. If parallel mooring is possible lines should be secured fore and aft so that the boat is held snugly but not tightly against the bank or dock. Fenders or other means of preventing chaffing of the boat hull should be employed.

3. Learn to use the proper, accepted and practical knot for all your work. A good knot is in no way improved upon by overtying knot upon knot. If you do not know when to use a standard knot nor how to tie it properly - learn to do so.

4. Make certain there are no spark producing devices in the vicinity. If boat is radio equipped make certain the radio is off.
5. Close all hatches in the boat.
6. Check condition of fuel tank vents and connections.
7. Ascertain approximately how much fuel is required in the tanks.
8. Keep nozzle of can or hose in contact with fill opening to guard against static sparks.
9. Exercise all caution to prevent overflow of tanks.
10. Close fill openings and reserve cans tightly.
11. Wipe up all spilled fuel immediately.
12. Properly dispose of all gasoline or oil soaked rags.
13. Permit boat to ventilate for at least five minutes with all hatches opened.
14. Reinspect tank well for leaks or gasoline fumes before restarting engines.

616.2 Mooring Lines and Security of Moorings

The security of your boat mooring is dependent upon several interrelated factors such as: size of lines, strain exerted by boat, the knots you tie, strength of the object to which moored and others. You must consider all of these if you are to return to the boat after mooring and find it present in an undamaged condition. You will need to study accepted mooring practices as well as the conditions under which you operate. Emphasis is placed here that you do not underestimate the stress put upon your mooring lines by a surging boat or if the water should drop (or rise) allowing full weight of the craft to fall on the lines. Learn about rope. New 3 strand manila of $\frac{1}{2}$ diameter is rated at 2,650 pounds breaking strength. The actual working strength of this rope, however, is only 20% of that figure. Also, do not underestimate the structural damage that can be done to a boat if it should be left suspended on adequate lines by falling water. On the other hand, many boats have been swamped in rising waters by secure but unattended moorings.

616.3 Mooring Lines Condition

Mooring lines are supplied each boat for one purpose only and it must be insisted they be used for no other purpose. Old or damaged lines shall be replaced as soon as possible. The lines must be kept in good condition and kept coiled for immediate use. Nothing is more worthless upon the water than a rat's nest of line thrown into a boat.

617. Loading of the Boat

The basic words of precaution in connection with all boating activities are, "don't overload". Overloading leads to a dangerous situation which you cannot feasibly correct once underway. Limit your load to the capacity of the boat and distribute the load correctly so that the boat assumes the correct trim. Once underway shift loads cautiously if it appears necessary. Correct trim of a vessel not only makes it a safer one, but increases the efficiency and pleasure of the cruise. Keep the load low and stow it in a secure manner. The number and placement of seats in a boat do not necessarily determine the most advantageous or safest position for the passengers. Assign seating positions as necessary and once underway request shifts of position if it appears the trim of the craft will benefit.

618. Preparing To Get Underway

618.1 General Instructions

It is to be made a matter of routine, that the employee in charge of a boating operation follow a detailed check-off prior to leaving the shore or dock. The manner in which this check is made is left to the discretion of the employee. As a convenient reminder, such lists will be posted in each patrol craft.

618.2 Underway Readiness Check List

Fuel including reserve adequate? Fuel vapor odors?
Water supply adequate?
Rations on board?
Tool box on board?
Minimum equipment on board?

Life ring clear of gear and clear line?
All passengers (including you) in life jacket?

Navigational lights (if required) working?

All gear on board properly stowed?
Passenger load properly distributed?

Radio check with headquarters if possible?
Boat trimmed?
All shipshape?

619. Engine Warm-up and Control Test

When you are assured that all is shipshape and the boat is prepared to get underway, the engines should be started and be permitted to warm up for a few minutes. Under no conditions, except those of exceptional emergency, i.e. fire, should the moorings be slipped until the engines are running. After a sufficient warm-up period the throttle controls should be tested by slight movements into gear, first one engine then the other, forward and reverse. This operation must be performed quickly and positively so that no headway or sternway is gathered. The throttles will, of course, be returned to neutral.

620. Leaving the Beach or Dock

When you are ready to pull away from the beach or dock notify the person attending the mooring lines, retrieve the lines and wait for the person on the beach to fully enter the boat (if he is to do so) before putting the boat under power. When pulling away from the beach or dock do not make the mistake of slamming the stern into it by not allowing sufficient maneuvering room. Proceed slowly until you have searoom.

625. Elements Of Boat Handling

In handling boats and ships of any size there are many common elements. Volumes have been written on the subject but most of them say the same things in different ways. Boat handling and seamanship manuals are available to you in the area library and you are encouraged to supplement the training you will receive with study of them. Books alone will not make a sailor, but used sensibly, they can be extremely helpful in guiding, and in evaluating your experience derived from observation and practice.

You will not advance far in becoming an expert waterman until you have fully accepted, without reservation, one basic doctrine: the power of water must not be underestimated. Water gives little latitude for recklessness, error or misjudgment. Fear and respect are no more closely associated than they are on the water, and to be afraid is not to be timid. Timidity has no place in water work, but never forget your calculation must be correct the first time. Water may not give you another chance.

The most common mistake in boat handling is travelling at speeds in excess of the demands of the situation. Speed through the water can be and often is very deceptive. The lack of passing objects by which to judge your motion is common to air flight. You will need to become fully proficient in estimating your rate of closure with other objects, as well as in judging distances where there is nothing upon which to scale. Fine mariners often bring their ships to a dead stop in the water before approaching dock. There is little difference in handling small craft. There is no place in our official duties for the "hotrodding" of a boat, and under no circumstances will such be condoned. There are most certainly times when positive and perhaps spectacular action is required in handling a boat well, but such action must be through expert judgement which cannot be in error if property, lives and reputation are to be undamaged. Smart maneuvering is not hazardous but rather is an indication of the alertness and experience of the operator.

Probably the second most common error of boat handlers is in not recognizing, or disregarding, the swing of the stern of the craft. Unlike an automobile, when you turn the wheel which throws the rudder (and propulsion with outboards) over, the stern of a boat swings a wide arc. This swing must always be considered in maneuvering.

Thirdly, remember that the effect of your rudder is decreased considerably as your speed is reduced. Keep plenty of power in reserve.

Keep constantly aware of currents and winds and their present and potential effect upon your boat.

626. Rules Of The Road

Boats are subject to traffic laws just as automobiles are; and like automobile traffic laws, those governing boat traffic vary according to locality. All employees of Glen Canyon National Recreation Area who are authorized to operate government boats, will be required to be thoroughly familiar with the "Rules of the Road" under which they operate, and will be expected to comply with those rules, except in emergency operations. National Park Service boats will be constantly and critically observed by the general public whom we are attempting to educate in the interests of safe boating. We cannot prevent accidents through such education or enforcement unless the actions of our personnel are beyond criticism.

627. Boating Laws - Federal and State

<u>REGULATION</u>	<u>NATIONAL PARK SERVICE</u>	<u>UTAH</u>	<u>ARIZONA</u>
WHO MAY ENFORCE REGULATIONS OF EACH AGENCY	National Park Service only	All peace officers of the State and NPS Rangers as Deputy Sheriffs of the State	All peace officers of the State, counties, and cities and NPS Rangers as Deputy Sheriffs of the State
INSPECTIONS	Any boat operated on the waters of Glen Canyon NRA may be inspected at any time	All peace officers shall have authority to stop and board any vessel subject to this Act whether on land or water	The operator of a watercraft may be ordered ashore to correct a violation, or issued a warning order to equip his watercraft properly
NUMBERING (FEDERAL BOATING ACT OF 1958)	State Regulations Prevail	Must be painted on or attached to each side of forward half of bow; letters and numbers 3" high; letter groups must be separated from numerals by hyphens or by equivalent spaces; in contrasting color to background; read from left to right. Fee: \$5. for 1 year	Same Fee: \$3. for 3 years
RECIPROCITY		90 days	90 days
<u>EQUIPMENT</u>			
LIFE PRESERVERS	State Regulations Prevail	All vessels shall have aboard one approved life preserver for each person aboard. Each child 12 and under must wear a life preserver at all times while aboard any watercraft	All classes of boats shall carry approved life preservers in serviceable condition for each person aboard. Any child 8 and under shall wear a life preserver at all times while aboard a watercraft

FIRE EXTINGUISHERS	State Regulations Prevail	All motorboats of closed construction (having enclosed areas in which inflammable vapors may collect), closed bilges, or having built-in gas tanks must carry a USCG-approved fire extinguisher
SOUND DEVICES	State Regulations Prevail	It is suggested that boat owners provide their boats with some type of horn or whistle (sirens prohibited)
VENTILATION	State Regulations Prevail	Enclosed fuel storage compartments must be ventilated by either a mechanical or an efficient natural system capable of removing gases
MUFFLERS	Vessels with internal combustion engines shall be equipped with a muffler. Vessels with underwater exhausts or with water discharging thru exhaust pipes are exempt so long as these methods of silencing are effective	Any and all motorboats operating on the waters of the State shall be equipped with an efficient device or means of muffling the exhaust sound emanating therefrom
FLAME ARRESTORS	State Regulations Prevail	All inboard motors must be equipped with approved type flame arrestors, and if carburation is not downdraft type, carburetor must be equipped with a drip pan

LIGHTS

State Regulations Prevail

When in operation during hours of darkness, all boats 16' and over must display a combination light on the forepart of the boat, showing red to port, green to starboard, visible for one mile, and a white 360° light aft, visible for two miles. Boats under 16' will be required to display a light or lantern visible for at least two miles. Boats moored or anchored offshore after darkness, except in an established anchorage, will be required to display a white anchor light showing all around the horizon

← Same (All watercraft)

← Same

OTHER EQUIPMENT

State Regulations Prevail

Boats shall be inspected for the following equipment: bail bucket or hand pump; paddle or oar, or anchor and line; flashlight or flare; smoke bomb or orange distress flag

OPERATION

OPERATOR

State Regulations Prevail

No persons under 16 years of age shall operate a motorboat except when accompanied by a responsible adult experienced in motorboat operation

INCAPACITATED OPERATOR

No person shall operate a waterborne vessel while under the influence of intoxicating liquor, narcotics, or habit-forming drugs, nor shall owner or operator of any vessel authorize or permit same to be operated by another person under circumstances outlined above

No person shall operate any motorboat or vessel while intoxicated or under the influence of any narcotic

No person under influence of intoxicating liquor, narcotic, or habit-forming drugs, or who by reason of mental or physical disability is incapable of operating a watercraft under prevailing circumstances, shall operate any watercraft. No person having a watercraft in his charge shall permit same to be operated by any person under circumstances outlined above

RECKLESS OPERATION

No person shall operate a motor vessel in a manner which unnecessarily interferes with the free and proper use of the navigable waters of the U.S. or unnecessarily endangers other vessels therein, or the life and limb of any person

No person shall operate any motorboat or vessel in a reckless or negligent manner, so as to endanger the life, limb or property of any person

Any person who operates any watercraft in a careless or heedless manner so as to be grossly indifferent to the safety of any person or property is guilty of careless operation

SPEED

No person shall operate a motor vessel at a speed greater than will permit him to bring the vessel to a stop within the assured clear distance ahead; in excess of 5 mph in designated harbors; or in excess of 20 mph within 200 feet of the shoreline or reefs

Boats will not be operated in excess of 5 mph within 150 feet of boat landings, swimming beaches, the shoreline, designated slow areas, buoys, water skiers, or other vessels

No person shall operate a watercraft at a speed greater than is reasonable under the conditions, having regard to actual and potential hazards existing

SITTING ON BOW

No person shall operate a motor vessel with any person riding or sitting on either the starboard or port gunwales thereof or on the decking over the bow

National Park Service Regulations Prevail

INTERFERENCE WITH NAVIGATION

No person shall operate any vessel in a manner which shall unreasonably interfere with other vessels or with the free and proper navigation of the waterways of the area. Anchoring in heavily traveled channels shall constitute such interference if unreasonable in the prevailing circumstances

No person shall operate any watercraft or swim in a manner which shall unnecessarily interfere with other watercraft or with the use of waterways or areas used for launching such watercraft. Anchoring or swimming in heavily traveled channels or blocking launching areas shall constitute such interference

RESTRICTED WATERS

Except to effect rescue or unless authorized, no vessel shall approach within 500 feet of any designated beach or within 1500 feet above Glen Canyon Dam or 2500 feet below the dam. The Superintendent may exclude vessels within any designated waters when such action is necessary to protect life and property

National Park Service Regulations Prevail

WATER SKIING

HOURS PERMITTED

During daylight hours only

Same

Same

OBSERVER

Required

Required except when towboat equipped with rear view mirror

Required

DIRECTION

Counterclockwise

National Park Service Regulations Prevail

LIFE PRESERVER

Water skiing prohibited within 500 feet of swimming beaches, harbors, and mooring areas, or within 100 feet of any person swimming outside a designated swimming area; or in main channels of the lake and in any area so posted by the Superintendent

National Park Service Regulations Prevail

ACCIDENTS

OPERATOR'S RESPONSIBILITY

Immediately stop and render assistance as may be reasonably necessary; furnish to any person injured and to the owner of the vessel involved his name, address, and full identification of the vessel he is operation, and the name and address of the owner thereof; report the accident to the Superintendent or his authorized representative as soon as possible.

Render immediate assistance; operator involved in any accident resulting in death or injury to a person or damage to property in excess of \$100 shall give his name, address, and boat identification to any injured person and to owner of property damaged. He shall also file a full report of the accident with the Utah State Park and Recreation Commission

Render immediate assistance; operator involved in injury or death to any person or in property damage shall give him name, address, and name of boat owner to occupants of struck craft. He shall report accident to most convenient law enforcement agency

MISCELLANEOUS

SANITATION

No garbage, paper, cans, bottles, or rubbish of any kind shall be thrown or dumped in the waters of the area, but shall be burned or buried, or disposed of at places designated for the disposal thereof. Waste from toilets or galleys on water-borne vessels shall not be discharged within one-half mile of landings, moorings, or other habita-
ted facilities

No person shall dump, deposit, throw or leave refuse, rubbish, debris filthy or odoriferous objects, substances or other trash on any waterways or on the shorelines of any waterways of the State

SWIMMING

Swimming from unanchored boats is prohibited. All children 12 years and under when in the water shall wear approved life preserve
ers

LIVERIES

Motorboats carrying passen-
gers for hire shall be pro-
vided with approved life
preservers for each person
carried and with an addi-
tional number of approved
preservers equal to at
least 10% of the total
number carried. Motorboats
while carrying passengers
for hire shall be operated
and navigated by a person
duly licensed by the Coast
Guard. Motorboats carrying
more than 6 passengers are
required to be inspected
and certified by the USCG

The owner of a boat livery
shall keep a record of the
names and addresses of the
persons hiring any vessels
operated as a motorboat,
the identification number
thereof, departure time and
date, and expected time of
return. The record shall be
preserved for 30 days. All
motorboats for hire must
comply with safety and
equipment requirements of
the State

Sam e

HOUSEBOATS

No waterborne vessel primarily designed or used for libing quatters shall be placed in or operated oh the waters of the area withour written authorization of the Superintendent

National Park Service Reguðations Pr evail

8.

USE OF GOVERNMENT-OWNED DOCKS, PIERS, AND FLOATS

Shall be used for loading and unloading of boats, except in emergencies. The use of such facilities for any other purpose is prohibited except upon written authorization of the Superintendent

National Park Service Regulations Pr evail

PRIVATE VESSELS

The Superintendent may require the issuance of a permit before any vessel is placed in or allowed to operate on the waters of the area. He may specify locations and conditions under which vessels may operate, and shall have the authority to revoke the permit and require the immediate removal of such vessel upon failure of the permittee to comply with the terms and conditions of the permit

National Park Service Regulations Prevail

COMMERCIAL VESSELS

No commercial vessel shall be launched or docked at any point on the federally owned shorelands surroujding the waters of the area or make use of any launching or docking facility within the area, except as authorized by permit, contract, or other written agreement with the United States

National Park Service Regulations Pr evail

630. Emergency Procedures

630.1 General

In boating operations, as in all other of our protection activities, it is mandatory that we be well prepared to meet any of a number of emergency conditions. Our profession requires it; our lives as well as those of others depend upon it. Emergencies of any kind create an atmosphere conducive to excitement, confusion and ineffective actions, if cool-headedness and alertness are not maintained by those persons involved. Our ability to meet an emergency in an orderly and effective manner will depend largely on several factors:

1. Individual temperament
2. Training
3. Experience
4. Pre-planning for such an emergency
5. Adequacy and condition of equipment

This manual points out what is expected in the way of readiness of boating equipment. Training and experience favorably influence the temperament of an individual, so that his reactions in an emergency situation usually become more and more stable and decisive as he learns and gains confidence in his ability to perform a skill well. Our local training and assignment is geared to that purpose, as well as to others. Our men are often alone when faced with emergency action. Such action, when performed by one man requires, most often, precise and quick acts in sequence on his part. When two or more men are present to take initial action in an emergency situation, exacting team-work is necessary if their performance is to be successful and efficient. It is obvious that emergency procedures must be standardized as far as possible within the organization if they are to be performed well. The procedures set forth in this section will, perhaps, require modification depending on the circumstances at the time of the action, but they are to be considered as standard operating procedures and need to be fully understood and learned by all concerned. Consideration should be given, from time to time, of what you would do if an emergency occurred at that particular instant. It is also expected that our men will drill together to perfect their teamwork.

630.2 Man Overboard

The procedure to be followed in case someone should fall overboard from your boat is as follows:

1. The person observing the occurrence will immediately call out "Man Overboard Port (or Left) Side" or "Starboard (or Right) Side" and immediately throw a life ring with flare light (1 cell flashlight) near the man in the water. Do not wait to reach a life ring if there is another life saving device (i.e. buoyant cushion) closer at hand. A life ring is best as it can be thrown farther with more accuracy and is easier for the man in the water to handle. The speed with which this operation is done can be very important.
2. Immediately, the boat operator will swing the stern of the boat away from the man, while shifting the engine on that side into neutral. Offhand, this maneuver may seem useless in a small outboard powered craft as it would appear the man would be astern of the propellers before the action could be taken. It is fully realistic, however, to consider that the man has grabbed a gunwale or other object while falling and is being dragged along the side.
3. Keep the man in view at all times. If there is another person in the boat with you, he is to act as lookout. If at night, use all available lights to illuminate the man in the water.
4. Maneuver the boat to approach the man from downwind, or into the sea or current. The maneuver used is left to your commonsense and judgement of prevailing conditions. You need to consider the condition and ability of the man in the water, whether or not you are alone, availability of assistance from other nearby boats, sea room, water conditions, etc. A common and usually effective operation is to turn 90 degrees from the course you were on when the man fell in, then when maneuvering room permits, to swing 180 degrees back to the man. Swift river currents would require modification of this action.
5. Make the final approach to the man as slowly as possible to maintain headway and use precaution not to slam the boat into him. If waves are running, caution is required that the man is not thrown against the boat.

6. When the man overboard is in proximity to the boat where his rescue is assured, the engines will be placed in neutral or if this will not insure against all possibility of revolving propellers, the engines will be stopped.

7. Consideration should be given to putting another man in the water to assist one overboard. This second man will wear a lifejacket and a line attached to the boat. Precaution should be taken that the boat is not swamped in the process of getting the man or men back aboard.

630.3 Fire Aboard

Fire is undoubtedly one of the most dangerous of the safety hazards in small craft boating. The very nature of gasoline as the fuel used in most boats makes it so, and when the risks common to boating activities are combined with the fuel hazard, the dangers are increased many times over. The fact that a fire may occur when the boat is afloat miles from assistance and the passengers are trapped aboard, makes the situation even more serious. Most fires are preventable, but only through good seamanship and alertness on the part of the boatman. Fire dangers of any kind in a boat must be corrected immediately. In spite of all good intentions and efforts of excellent boatmen, fires do occur. Sections of this manual are devoted to the prevention of conditions conducive to fires as well as to the storage and maintenance of firefighting gear. Prompt action with reliable equipment may well make the difference between a minor fire and a serious accident. You must be well prepared - equipment wise and planning wise - to meet the instantaneous demand of a fire aboard your boat. Specific instructions are not possible, but the following steps need to be considered and carried out when applicable:

1. Be aware of the location and condition of firefighting equipment aboard the boat. Orient your passengers.
2. Maneuver the boat to bring the fire on the leeward (downwind) side. Cut your power to reduce wind effect on the fire. Close hatches, ports, vents, etc. if this will aid in control.
3. If practical, jettison burning materials.
4. Attack fire with proper extinguishing agent.
5. All hands aboard must be in lifejackets. Make all preparations for abandoning the boat. If radio equipped notify headquarters or other personnel of your actions.

630.4 Collision

Our patrol craft must operate under various conditions of weather, water and boating activities among inexperienced boaters. It is not unreasonable to assume that our boats may, at sometime or other, be involved in a collision with other boats or objects. Rescue activities will increase this possibility as will floating objects on the rising lake waters. It is very likely, therefore, that anyone of our boating personnel will at sometime be faced with the situation requiring action to keep a boat from foundering, sinking, and to protect the occupants from serious injury or loss of life. In addition to the protection of life, which must be given primary concern, there is also the necessity of making the fullest attempt to save the boat and its contained equipment.

The "Rules of the Road" and applicable boating laws were adopted to prevent collisions between watercraft. As pointed out elsewhere in this manual these rules must be obeyed. In a crossing or meeting situation, the important thing is to act so far in advance of the time of possible meeting and to act so positively that no misunderstanding can arise. This procedure will avoid most dangers of collision.

When approaching craft reach a point at which they are dangerously close, there is a "Rule of the Road" known as the General Prudential Rule which applies: Article 27, (Inland Rules) "In obeying and construing these rules due regard shall be had to all dangers of navigation and collision, and to any special circumstances which may render a departure from the above rules necessary in order to avoid immediate danger." Whether or not the Inland Rules are applicable to the waters of Glen Canyon, this one makes good sense. There are also "due caution" laws among the State Boating Acts.

When an operator of one of our boats finds himself in a position where collision is imminent and unavoidable, he shall:

1. Maneuver as much as possible to avoid the full impact of a head-on collision, and to make the blow as glancing as possible.
2. Back down by reversing the engines.

3. Consider that immediate separation of the boats (or other object) involved in a collision, when the hull is punctured, may cause immediate foundering, whereas if the colliding boat remains in position plugging the hole, it may permit time to make temporary repairs excluding the water. It may be necessary to lash the boats together in the position of impact until assistance arrives.

4. All assistance possible will, of course, be given the other boat and the proper report forms will be completed.

630.5 Abandon Ship

Anyone of a number of types of casualties while afloat can lead to the necessity of the abandonment of your boat. Fire of serious consequence, swamping, capsizing, or collision with another craft or object can cause a situation which leaves no recourse as to your action except to take to the water. In some cases assistance or the shore may be close at hand; in others, your predicament may not be known for a considerable length of time and your rescue may be delayed by other factors. You should always be prepared by pre-planning and by having equipment for such an emergency. The following guidelines are established for such a situation:

1. If time permits before abandoning the boat:
 - a. Make the boat as watertight as possible by closing all hatches, doors, vents, etc. Jettison heavy, non-buoyant gear and secure all buoyant gear so it will remain in the boat.
 - b. All hands will be in lifejackets.
 - c. Send out a distress message on your radio if the boat is so equipped and/or with other distress signals (flares, Very pistol, etc.) if it is likely they will be seen. Do not waste such signals if assistance is not likely but take the signals off the boat with you.
 - d. Attempt to spread the emergency signal tarp (part of each boat box) over the hull or attach it so that it will be available with the floating boat. See Section 630.6 Distress Signals)
2. Once in the water Stay With The Boat if the hull floats. Many fine swimmers have been drowned attempting to swim ashore even though a short distance away. Many non-swimmers have been saved after extended periods of time when they have clung to the capsized boat. Available lines thrown across the hull and attached to those persons in the water can be an added precaution. Keep your head.
3. Immediately following entry into the water, the person in charge of the party, or some other responsible person, should account for each member of the party. A search should be made for those missing, particularly under the hull of an overturned boat.
4. If the hull fails to float, members of the party in the water shall stay in a group even if it means tying the group together by some means.

5. Remember that the hull of a boat or a floating group of persons will be more easily sighted than individuals floating apart from each other.

6. When you sight a boat or plane within reasonable distance use your emergency signals.

7. If you should make your way to shore build a large signal fire on the beach. It is primarily for this reason a waterproof match container is attached to your lifejacket. Do not light the fire until you are sure possible assistance is sighted. If a warming fire is needed, it should be a separate fire.

630.6 Distress Signal

The term "Distress Signal" as used in Glen Canyon National Recreation Area shall have one and only one meaning,

"I am in distress and need help."

The designated distress signals shall be used for no other purpose nor in any promiscuous manner. The organization of rescue or assistance efforts is a serious and expensive undertaking; one for which the real need must not be mistaken.

Any signal that will attract attention to your situation and bring help is a satisfactory one, but unless your signal is definitely recognized as one of distress, your chances of receiving prompt assistance are lessened. Several situations of distress can arise among our personnel while afloat. Among them are:

1. Capsized or sunken boat which you have abandoned.
2. Fire aboard.
3. Stranding afloat - engine trouble, etc.
4. Stranding ashore - engine trouble, hull damage, sunken boat, etc.
5. Passenger overboard and not immediately recovered.
6. Require assistance to handle visitor or other emergency.
7. Others

The latest distress signal for small boats on the waters of the United States is that of slowly and repeatedly Raising and Lowering Arms Outstretched To Each Side. To be effective as possible, this signal should be given from the highest vantage point on the boat with consideration given to color contrasts.

A local distress signal for Glen Canyon NRA, and the only one that will vary from the recognized listing of such signals, will consist of exposing the brilliant, reflective side of the tarp carried in the boat box of each craft. The tarp face (reverse side is black) is coated with Radiation Purple Paint on a silk screen process. It is a product developed by the Atomic Energy Commission which meets exacting visibility requirements. It is doubted if this material will be common among the visiting public so the signal should be a distinct one. Precaution should be taken that this tarp be reserved for the distress signal purpose, so it will be read with no other meaning by our employees. Our tests show that it is clearly visible from the air at reasonable elevations.

On the following page is a table of recognized distress signals with which our personnel should be familiar. You will note that the signal sent by radiotelephony, in case of distress, is "Mayday".

In the interests of conformance and uniformity, that signal has been adopted for use in Glen Canyon NRA and will be used by our employees if the need should arise. Marine distress flares (three 5 minute) are included in each boat box.

Recognized Distress Signals

Exposure of radiant tarp - Glen Canyon NRA only.

A gun or other explosive fired at intervals of about a minute.

A continuous sounding with any fog-signal apparatus.

Rockets or shells, throwing red stars fired one at a time at short intervals.

Signal made by radiotelegraphy or by any other signaling methods consisting of the group ...—... (SOS) in Morse Code.

A signal sent by radiotelephony consisting of the spoken work "Mayday."

The International Code signal of distress indicated by N.C.

A signal consisting of a square flag having above or below it a ball or anything resembling a ball.

Flames on the vessel (as from a burning tar barrel, oil barrel, etc.)

A rocket parachute flare showing a red light.

Rockets or shells, bursting in the air with a loud report and throwing stars of any color or description, fired one at a time at short intervals.

631. Bibliography

* Those publications with an asterisk (*) are required reading for all new employees whose work brings them in contact with boating.

- *1. Recreational Boating Guide, CG-340, U.S. Coast Guard, 1960.
- *2. Rules of The Road, CG-169, U.S. Coast Guard, 1959.
- *3. Rules & Regulations for Uninspected Vessels, CG-258, U.S. Coast Guard, 1959.
- *4. Rules & Regulations for the Numbering of Undocumented Vessels & the Reporting of Boating Accidents, CG-267, U. S. Coast Guard, 1959.
5. Equipment Lists, Items approved or accepted under Marine Inspection & Navigation Laws, CG-190, U.S. Coast Guard, 1960.
6. Vessel Examiners Guide, CG-289, U.S. Coast Guard, 1960.
7. Aids to Marine Navigation of the U.S., CG-193, U.S. Coast Guard, 1959.
- *8. Modern Seamanship, 11th Edition, Knight, Austin M., D. Van Nostrand Co., Inc., 1945.
9. Piloting, Seamanship and Small Boat Handling, Chapman, Charles F., Motor Boating, 572 Madison Ave., N.Y., 1959.
10. Harbor Craft Crewman's Handbook, TM 55-501, U.S. Dept. of the Army, 1958.
11. Boatswain's Mate 1 and Chief, NAVPERS 10122-B, Bureau of Naval Personnel, 1958.
12. Diving Manual, NAVSHIPS 250-538, U.S. Navy, 1958.
- *13. Digest of State Motorboat Laws, Outboard Boating Club of America, 307 N. Michigan Ave., Chicago 1, Illinois, 1960.
14. Engineering Manual of Recommended Practices Outboard Boating Club of America, 1961.
15. Safety Afloat, For Owners of Small Boats, Dept. of Transport, Ottawa, Canada, 1961.

These publications, and several others, will be kept in the Chief Ranger's office. They are available, and recommended, for use by all personnel. Indexes for several periodicals are filed, and are also available for all personnel.

BOATING SAFETY CHECK

Glen Canyon National Recreation Area

Date _____

Class of boat: A. _____ 1. _____
 0' - 16' 16' - 26'
 2. _____ 3. _____
 26' - 40' 40' - 65'

Type of Boat: I.B. _____ O.B. _____
 I.O. _____ Jet _____

H.P. _____

CODES: OK - Meets Requirements
 N/AC - Does not meet Requirements
 N/R - Not Required

REMARKS

CERTIFICATE OF NUMBERS _____

DISPLAY OF NUMBERS _____ Number _____

LIFE SAVING DEVICES _____ Number _____

FIRE EXTINGUISHERS _____

NAVIGATION LIGHTS _____

SOUNDING DEVICE _____ Type _____

VENTILATION _____

FLAME ARRESTOR _____

PADDLE OR OAR _____

BAILING DEVICE _____

SANITATION _____

Lake Powell Aids to Navigation and Harbor Markings Understood _____

Boat used for Fishing _____ Skiing _____ Day Cruising _____ Camping _____

Capacity Plate _____

Number of people on board: Adults _____ Children _____

Any suggestion of operator/owner of boat about the area or inspection: _____

Your comments about the boat: _____

GLCA Sticker Issued: Number _____ Not Issued _____

Inspecting Officer

Glen Canyon National Recreation Area

National Park Service

BOAT PATROL REPORT

Date _____ Departure Time _____ Return Time _____

Patrol Boat _____ Weather _____

Area of Patrol: (Give destination and patrol objective)

Lake Conditions: (Note any natural or man-made hazards; debris areas, faulty navigational aids, etc.)

PATROL OBSERVATIONS

Boating Violations Corrected	Total Number	Boating Violations Corrected	Total Number
ITEM	NUMBER	ITEM	NUMBER
WATER SKIING		BOAT OPERATION	
No Observer		Sitting on Gunwales	
In Prohibited Area		Dangerous Wake	
In Clockwise Direction		Reckless Operation	
No Ski Belt		Speeding	
Other:		In Prohibited Area	
		Other:	
REQUIRED EQUIPMENT			
No Running Lights (If after dark)		Insufficient Preservers	
Insufficient Sounding Device		Insufficient Extinguishers	
		Insufficient Paddling Device	
		No Bailing Device	

REMARKS: _____ _____ _____ _____	No. Boats Observed _____
	No. Violations Corrected _____
	Reporting Patrolman _____