

## TABLE OF CONTENTS

	PAGE
1. TABLE OF CONTENTS	
2. MAIN CHARACTERISTICS, editor's notice	3,4
3. MACHINERY	
3.1 ENGINE	5
3.1.1 Cooling system	8
3.1.2 Fuel system	11
3.1.3 Lubricating system	12
3.1.4 To bleed the fuel system	14
3.1.5 Starting and stopping	15
3.2 GEAR-BOX	16
3.3 PROPELLER AND PROPELLER SHAFT	18
3.4 STEERING AND ENGINE CONTROLS	20
4. ELECTRIC SYSTEM	
4.1 BATTERIES	22
4.2 CHARGING SYSTEM	23
4.3 FUSES	24
4.4 DETECTING THE FAULTS	25
4.5 ZINC ANODES	26
5. RIGGING AND SAILS	27
6. BILGE PUMP, THROUGH HULL FITTINGS	28
7. WHEELHOUSE	30
8. ACCOMODATION AND PLUMBING	
8.1 GALLEY	32
8.2 FRESH WATER SYSTEM	33
8.3 SANITARY SYSTEM	37
8.4 HEATING	39
8.5 GAS SYSTEM	41
9. HOW TO SAIL A NAUTICAT	
9.1 HOW TO USE THE MACHINERY	42
9.2 CRUISING UNDER POWER	45
9.3 OPERATION UNDER SAIL	48
10. LAUNCHING AND FIT-OUT	55
10.2 LAUNCHING	55
10.3 RIGGING	55
10.4 POST LAUNCHING CHECKS, TRIAL	57
11. MAINTENANCE OF HULL AND WOODEN PARTS	59
12. LAYING UP AND WINTER STORAGE	61

Dear Customer, Honoured Member of the NAUTICAT family,

We are very happy to thank you for the confidence you have shown us when choosing a NAUTICAT for your new yacht. We hope that she will meet your expectations and demands in every possible way.

In this manual we have explained the basic structure and function of a NAUTICAT 36 in order to make it easier for you to get acquainted with her. Modern yachting technology has been brought to a level at which thorough initiation into relevant facts is often required.

Thus we hope that you take the trouble of reading these instructions well before using the craft. This, we are sure, will lessen the risk of possible complications, and, what more, will enable you to feel at home sooner in your new yacht.

In case of defects possibly covered by your warranty, please secure authorization from us before undertaking any repairs.

We kindly ask you for the favour of keeping in touch and sharing your experience with us, in order that we might go on improving our designs in the future.

Assisted by the latest techniques in yacht building, we have strived to build you a safer and more reliable yacht, encompassing the experiences we have gained from building more than a thousand yachts and motor sailers.

We wish you many happy hours at the helm of your NAUTICAT.

With best regards

Pentti Siltala

II. SPECIFICATIONS

A. General design specifications

Length Overall	10,85 m / 35' 8"
Length Overall incl. bowsprit	11,85 m / 38' 11"
Length Waterline	9,40 m / 30' 84"
Beam	3,30 m / 10' 10"
Draught	1,60 m / 5' 10" (long keel version)
Height above waterline	14,50 m / 47' 8"
Freeboard forward	1,73 m / 5' 8"
Freeboard aft	1,64 m / 5' 5"
Displacement	8 tons
Internal ballast	3 tons
Fresh Water Capacity	450 litres

Propulsion

Engine	Ford Lehman Super 90 4 cyl. diesel
Output	90 hp/2600 RPM (66,0 kW)
Gearbox (hydraulic)	Borg Warner CR 71, 2,1:1
Propeller	22" x 16" of manganese bronze
Propeller shaft	Ø 40 mm stainless steel
Stern gland	stern gland with packing and greaser
Fuel capacity	2 x 300 litres
Action radius	90 % of fuel capacity = 495 nautical miles
Cruising speed	8,5 knots
Cruising range	550 nautical miles

Sails and Masts

Height of Main Mast from waterline	14.50 m / 47' 8"
Height of Mizzen Mast from waterline	10,80 m / 35' 6"
Length of Main Mast	12,56 m / 41' 3"
Length of Mizzen Mast	8,0 m / 26' 3"
Sail Area (standard sails)	<u>Standard boat</u> 76,4 m <sup>2</sup>
Main Sail area	21,7 m <sup>2</sup>
Genoa Sail area	47,1 m <sup>2</sup>
Mizzen Sail area	7,6 m <sup>2</sup>

## Shipping dimensions in cradle:

LOA	10,85 m	35,7 ft
LOA with bowsprit	11,85 m	38,8 ft
Width	3,30 m	10,9 ft
Height long keel	4,20 m	13,9 ft
Weight, cradle included	8 tons	

Editor's notice

The facts and figures given in this manual are subject to alterations without prior notice from Siltala Yachts. The manual is constantly being revised, and this edition is accurate only for boats delivered later than April 1984 and before the issue of a new edition. It will, however, be useful also for other boats, as far as practical advice rather than factual accuracy is concerned.

## 3.1. ENGINE

Technical data

Ford Lehman Super 90 marine diesel, converted from a Ford 2722.  
The type identification on the heat exchanger, the serial number on the starboard side of the engine block, just aft of the fuel pump.

cylinder volume	4 150 cm <sup>3</sup>
stroke	115 mm
bore	107 mm
number of cylinders	4
firing order	1,2,4,3
max. output	90 hp/2600 RPM (66,0 kW/43,3 RPS)
continuous output	72 hp/2400 RPM (52,9 kW/41,6 RPS)
maximum torque, overloaded	29,1/1600 RPM 186 lbf/26,7 RPS
injection pump	Simms row pump
cooling system capacity	15,0 l (3,3 imp, 4,0 US gal)
lubricating oil capacity	10,5 l (2,3 imp, 2,7 US gal)
oil filter capacity	1,0 l (1,5 imp pint)
injection pump oil capacity	0,36 l (0,63 imp pint)
nozzle opening pressure	setting pressure new/recon = 208 -218 bar working pressure once 10 hrs service completed = 197 bar
fan belt dimensions	13,0 x 1120
tightening torque on cyl. head	1st stage 60-75 Nm 2nd stage 122 Nm 3rd stage tighten through further 90 degrees
injector retaining bolts	17-22 Nm
rocker shaft pedestal bolts	23-30 Nm or 17-22 lbf

Tightening  
torquesValve clearances

valve clearance, inlet (hot engine) 0,381 mm (0,015 in)  
exhaust (hot engine) no rotator caps: 0,381 mm  
with rotator caps: 0,305 mm (0,012 in)

Lubricant recommendations

BP Energol HD 20w/30 or BP Vanellus C3/30  
Esso Extra 10w/30 or Essolube D 3/30  
Shell Rotella TX or Shell Rimula CT 30

Causes of engine trouble

Please study the enclosed Ford owner's manual thoroughly. In the following we have assembled the chief facts about maintenance and adjustments, adding our own experiences. We often refer to the manual, and recommend you to make yourself familiar with it, especially the fault-finding chart. It may be very useful to know it well.

As a rule, surveying the engine performance, hatches opened, is a measure worth taking at times. Check odd noise, fan belt, possible water or oil leaks.

Also check the tightness of the battery terminal clamps periodically. Poor contact may pass unnoticed until using the starter motor, which demands a great deal more current than most service circuits. Another reason for failing starting may be falling voltage due to insufficient water level in the batteries.

In the checking lists of the manual and below you will find what checks are to be made as regards oils and liquids, but in general one cannot check the engine oil, gearbox oil, cooling liquid, battery water level too often. Evaporation in the batteries is higher in the summer, or with constant charging.

One important cause of engine trouble is fan belt damage, which happens if the alternator bolts slip and the alternator pulley is out of line. Check therefore, while the engine is running, that the fan belt runs straight in the groove and that the pulley are in line.

Remember that proper tools can often be harder to find than qualified craftsmen.

Always keep the following spare parts on board:

1. Alternator fan belt

2. Seawater pump impeller
3. Oil filter
4. Fuel filter

On longer trips also:

1. Injection pump nozzle
2. Flexible fuel pipe or one spare fuel pipe with fitted connection pieces
3. One set of engine gaskets ("top overhaul set")

Special tools:

1. Torque wrench
2. Feeler gauges for adjusting valve clearance
3. Cleaning brush for cables and battery terminal clamps
4. Engine turning bar

IMPORTANT

Study the ford manual SUMMARY OF REGULAR MAINTENANCE thoroughly, and note especially the "after first ... hours" measures!

### 3.1.1 Cooling System

The engine is fitted with a two circuit cooling system.

Sea water  
cooling system

The primary circuit or seawater system uses sea water taken through a seacock and a strainer, visible down to the left by the engine compartment entrance. The seacock lies under the strainer. The strainer vessel has a transparent top plate, which can be removed by undoing the wing nut and lifting. The strainer can be lifted out and cleaned. Close the shut-off valve before opening the strainer.

From the strainer the water flows through the gear-box oil cooler and further to the water pump on the starboard side of the engine under the injection pump. From there the water is pumped to the engine oil cooler which is fitted to the cooling water heat exchanger on the fwd top part of the engine. The sea water proceeds through the heat exchanger and into the exhaust manifold, from which it flows through a U-shaped rubber hose (the upper part of which is above the waterline) on top of which there is a ventilation pipe preventing water siphoning into the engine through the exhaust pipe, when the engine isn't running. A small part of the cooling water runs out of the ventilation pipe through the hull on the starboard side. The U-shaped hose ends in the muffler situated down to the right by the engine compartment entrance, from where the exhaust cooling water mixture is expelled through the exhaust pipe.

The exhaust pipe is made of reinforced rubber, the muffler of stainless steel. The exhaust pipe through hull fitting has no shut-off valve.

Sea water  
drainage

When the boat has been hauled drain the system as follows:

- open the drain cock under the heat exchanger salt water outlet.
- open the drain cock under the exhaust manifold rear end.
- undo the drain bolt under the gear box oil cooler, port end.
- undo the drain bolt of the exhaust muffler.
- undo the hose clamp under the salt water pump and let drain.

Then either suck a 50% fresh water/anti freeze mixture into the system by undoing the hose from the water strainer and

dipping it into a barrel, or open the sea water pump, remove the impeller, and wipe it with glycerine. You can even do both.

Replace the  
sea water pump  
impeller

The sea water pump impeller has to be replaced from time to time, due to wearing down. Unscrew the lid, lift out the impeller by hand, or using a screw driver to help it out. Install the new impeller and close the lid. The wings in the same direction! THE ENGINE ZINC ANODE CAN BE CHECKED AND CHANGED when the system is drained.

Secondary circuit/  
fresh water system

The fresh water engine coolant circulates through the water jackets around cylinder block, cylinder head, exhaust manifold and through the heat exchanger. The rotary pump driven by the fan belt is located at the fore end of the engine. In the tubular heat exchanger (on starboard side of engine) the engine coolant is cooled by the sea water. A thermostat under the expansion tank (marked Ford Lehman at fore end of engine) controls the engine temperature by regulating the rotary speed of the engine coolant.

The total capacity of the fresh water system is 15 litres, 14.1 US quarts. The amount of anti-freeze is 50 %. Always use anti-freeze, even in the summer, because it contains substances which prevent corrosion. Fill through the expansion tank twist cap.

ling

Overheating due  
to clogged sea  
water system

If, for some reason, the sea water stops circulating, it will not appear immediately. The engine coolant does not start boiling at once. But the rubber exhaust hose will soon get overheated. If you smell burnt rubber or see black smoke coming out of the exhaust pipe, immediately stop the engine and check the exhaust pipe rubber hose and the water strainer or the sea water pump. The reason may be a plastic bag or built up weed in the strainer, or the sea water pump rubber impeller which has broken down.

The strainer can easily be cleaned by unscrewing the wing nut on top of the vessel and lifting the strainer out. Do not forget to shut the seacock under the strainer.

If leaks have occurred in the hose, they can be mended temporarily

with cloth, tape or silicone. But remember to renew the hose, aided by a qualified person, as soon as possible. This applies also to situations when the hose seems "stiff" and has lost its flexibility, due to aging if there is a leak in the exhaust pipe dangerous exhaust gas will enter into the cabin.

Engine zinc anode  
(engines marinized  
by Lehman)

To prevent electrolysis and corrosion in the seawater system the engine has been earthed with a zinc anode, placed in the heat exchanger, fastened with a brass bolt.

Fresh water cooling  
pump driven by fan  
belt

Important:

The fresh water cooling pump is driven by the fan belt. Thus the system will boil in case of a fan belt failure.

Sea water cooling  
pump connected by  
engine shaft

The sea water pump is driven by a pinion connected to an engine shaft cog wheel, and is not affected by a broken fan belt.

Buzzer

A buzzer on the instrument panel warns for overheating in the fresh water cooling system.

### 3.1.2 Fuel system

#### Engine trouble

To eliminate engine trouble it is essential that the fuel is free from water, dirt or other foreign bodies, i.e. completely clean. Our experience is that polluted fuel causes the greater part of all engine trouble, wherefore we recommend you always to filter the fuel when refilling and to check the water separator, located on the engine room aft bulkhead, frequently. If the fuel tanks have been half-empty for a longer period, particularly over the winter, condense water will gather on the tank bottoms.

Both tanks feed to the water separator, before which each pipe has a tap. If suspected that either tank contains polluted fuel it can be shut off here.

Uneven running can sometimes be eliminated simply by taking this measure. If you should want to use only one tank, for trim or other reasons, use the taps.

Glass bowl filter  
= water separator  
= water trap filter

The glass bowl filter should be checked for possible water and dirt, which will show as "pearls" on the bottom. When changing the fuel filter the paper filter of the water separator should also be replaced. When draining the bowl, first undo the bleeding nut on top of the bowl. Then open the draining nut at the bottom, and drain. Unscrew the centre bolt on top of the separator, and the bowl and alloy + paper filter come loose. Change the paper filter (nr. 7111-296) and re-install in the reverse order.

Always bleed the engine after filter change, and after draining.

The air heater draws fuel from the port tank. Engine surplus fuel is returned to the other tank, i.e. the starboard tank.

There is no balance pipe between the two tanks wherefore they must be filled separately.

### 3.1.3 Lubricating system

The maintenance of the lubricating system is of utmost importance. Good care makes your engine last longer and saves you trouble.

The engine is pressure lubricated with a camshaft driven lubricating pump which feeds oil to the bearings and other lubricating points. The system has a built-in main-flow filter through which the oil passes.

#### Technical specification

Oil class	API D (CD) or range III
Viscosity	20 W-20-20 W-40 or SAE 30
Examples	Shell Rotella TX 20 W-30 Rimula 30 Essolube D3-20 W-30
Oil filter element	FRAM PH8A
Buzzer Red warning light	} alarm when the oil pressure danger limit is reached.

#### Oil pressures

Hot engine	3,5 - 4,0 kp/cm <sup>2</sup> /1800 RPM
Danger limit	1,5 kp/cm <sup>2</sup> /1000 RPM

It may occur that the oil pressure rises to about 4,5 kp/cm<sup>2</sup> when the oil is cold. It may also happen that the pressure goes down to 1,5 kp/cm<sup>2</sup> when the engine is hot and in neutral. However, it will rise again at increased revolutions.

#### Measures to be taken if something is faulty

1. Check the oil level, top-up, if necessary, and check that no oil is leaking out anywhere.
2. If the gauge does not indicate proper pressure although the above measures have been taken:
  - check if the indicator moves when you switch the power on and off (engine not running)
  - arrange a short circuit between the wires of the pressure gauge sensor. If the indicator moves the sensor is faulty, if

the indicator doesn't move it is faulty itself. The sensor is fitted to the oil pan, port side of the engine.

3. Open the engine oil filling cap. Dry **one** rocker arm and start the engine. If oil flows through the hole in the rocker arm you may continue running until the gauge can be checked.

#### Oil change

The first oil and filter change is due after the first 15-20 running hours and after that every 200 running hours, or once a season. Before going to sea, and every 10 hours, check **the** oil level. The dip-stick is on the port side of the engine close to the starter motor. The oil level should never be below the "safe" mark. Change the oil of the injection pump once a season and check the oil level at least twice a season (see engine manual).

#### Dip-stick

#### Oil filter change

For instructions on how to change the filter, see Ford Manual, page 21.

During the first 100 hours the oil level should be checked daily. The oil consumption will diminish after the first 100 running hours.

### 3.1.4 To bleed the fuel system

Make sure that there is sufficient fuel in both tanks. Should one of the tanks be empty close the fuel tap.

Check the water separator. If dirty, drain.

If the fuel lift pump priming lever is in an upper position turn the engine 1/4 turn with the starter motor while pushing the stop button. This will make the pump work.

Open the bleed screw on the outlet, FWD, side of the fuel filter (Ford p. 31 Fig. 23). Operate the priming lever on the fuel lift pump until a flow of fuel, free from air, is expelled from the screw. Close the bleed screw operating the lever simultaneously. Collect the fuel in some rag.

Open the forward bleed screw on the injection pump (Ford p. 28 Fig. 17). Operate the lever again and close the screws when the air is out. Now you can start.

Leave the engine room hatches open for 10-15 minutes after every adjustment.

### 3.1.5 Starting and stopping engine

Make sure that the main switch (located on the steering console) is in position 1 or 2. (Ford manual p.11, fig.2)

Check engine oil, water level and and battery water level.

Remote controls  
coupled to prevent  
starting accidents

Check that both throttle-gear remote controls are in neutral. This is important, because the starting circuit is equipped with a current restrictor, which is not engaged when either control is in gear. The remote control gear cables are coupled by means of an engine room lever, which controls a common gear cable running to the gear-box. If the common cable is not in neutral, the current restrictor cuts the current.

(The coupling has been done in order to eliminate the risk of running into a pier or a neighbour when starting the engine)

Pull the remote control out into idle and push it forward into half throttle. (Some controls have an idle knob, which you either push in or pull out) C.f. Idle position, ch. 3.4

Turn the ignition clockwise to position 3 (Ford manual, page 11, fig 2). The red alarm light goes on and the buzzer gives a signal. Turn the key to springloaded position 4 and keep it there until the engine starts. If the engine does not "fire" in 15-20 seconds turn the key back to position 2, wait 2 minutes and try again. If the starter motor does not move when you turn the key to position 4 the current restrictor is not in neutral. Moving the remote controls helps. When the engine has started, decrease revolutions.

Immediately after starting, check the following:

- engine oil pressure ( $3,5 - 4 \text{ kp/cm}^2 = 50-55 \text{ lbf/in}^2$ )
- gear box oil pressure ( $7,5 \text{ kp/cm}^2 = \text{about } 105 \text{ lbf/in}^2$ )
- that the red warning light goes off and the buzzer stops sounding (if the warning light does not go off when the engine runs at about 1400 RPM stop the engine immediately and start looking for the defect.) (Ford manual Fault finding chart, p.35)

Stopping

Stop the engine by pushing the stop button on the wheelhouse switch panel. Never turn off the current (with the starter key) before stopping!

### 3.2 GEAR-BOX

A Borg-Warner 10-17-010 2,1:1 gear box with a reduction gear is fixed to the flywheel housing of the engine.

#### Technical specification

Type	Borg-Warner Velvet Drive (10-17-010)
Reduction gear	2,1:1
Direction of rotation	left (viewed from stern)
Oil capacity	1,7 litres (without oil cooler)
Oil type	Automatic Transmission Oil Suffix A Examples: Shell Donax T6 Esso 2974 Suffix A
Oil pressure	about 7,5 kp/cm <sup>2</sup> - 9,6 kp/cm <sup>2</sup> (106,5 lb/in <sup>2</sup> - 136,4 lb/in <sup>2</sup> )

The clutch is a multiplate wt type clutch in oil bath, consisting of three different clutches: ahead, neutral and reverse. The gear is engaged with a lever which regulates the pressure for various clutches.

If the gears don't work, check the following points

#### Dipstick

The dipstick is on the port side of the gear-box. Turn it to the left to open. The dipstick has marks for upper and lower levels. Since the oil cooler takes an additional 0,5 litres (= 1 pint) of oil the gear box oil level should always be above the upper mark. Always use a funnel when refilling.

#### Gear lever

The lever is located on the port side of the gear box. It has a springloaded ball which fits in the dimples (ahead-neutral-astern) on the gear housing. During the first 100 running hours the control cable may stretch and the ball may not locate into the holes when changing gears. The cable can be adjusted by turning the fork end. One possible fault may also be the fork end which is loose.

If you have to refill the oil always check possible leaks. Due to the high oil pressure the oil jet at a leak may be very hard to see with your eyes, but you can approach a piece of paper to

the unions, and check for oil stains .

The gear oil pressure is normally  $7,5 \text{ kp/cm}^2$  when the clutch is warm.

The gear oil pressure gauge flickers between  $7,5$  and  $4 \text{ kp/cm}^2$  when changing from neutral to forward. This is quite normal, since the pressure falls momentarily when the forward clutch cylinder valve is opened. The phenomenon does not occur when changing to reverse, since the reverse cylinder is smaller.

## 3.3 PROPELLER AND PROPELLER SHAFT

Shaft

Material	AISI 329 (cont. 2324)
Diameter	40 mm
Cone or "taper"	1:10

Flexible coupling

Type	Vetus
Size	10

Stern gland

Bronze stern gland with flexible rubber hose installation.

Greaser

The greaser is located under the companionway steps\* and connected with a pressure hose to the stern gland.

Grease	Shell Rodina Grease or Unedo 2
Capacity	about 250 g = 9 oz
Operation	turn the handle of the greaser every 10 running hours until the handle feels "hard". A few drops of water may come out when cruising, but it does not harm the lubrication.

Stern bearing

"Strut"

The bearing is installed in the shaft supporter, or strut.

Type

BTR Silverline 40 mm x 55 mm x 160 mm water lubricated rubber bearing

Propeller

3-blade left hand bronze propeller

\* location depending on layout. Follow hose from stern gland to find it!

Diameter	22"
Pitch	16"
Cone	1:10
Key	10 x 10 x 50

Rotary direction left

**CAUTION!**

The water lubricated rubber bearing will be damaged if the propeller shaft is rotated out of the water!

### 3.4 STEERING AND ENGINE CONTROLS

A Teleflex/Capilano hydraulic steering system, consisting of the following units, is standard.

- |                               |          |          |       |
|-------------------------------|----------|----------|-------|
| 1. Steering pump (wheelhouse) | Capilano | 275 V    | 275 V |
| 2. Steering pump (poop deck)  | Capilano | 275 V    | 275 V |
| 3. Uniflow connection valve   | Uniflow  | 50       |       |
| 4. Rudder cylinder            | Teleflex | BA 175/7 | TM    |

#### Oil filling

We advise you to check the oil level from time to time (once a month) because of a.o. temperature variations, and, if necessary, add oil.

An expansion tank is fitted on the aft steering pump. The volume is about 0,2 litres (= half a pint). The oil can be filled through the cap by the aft steering console. Fill until you can see the oil level. Oil volume of the steering system about 6 l (= 1,3 gallons; 1,6 US gallons).

Oil specification	Automatic Transmission Oil Suffix A
Examples	Shell Donax TM
	Esso 2974 Suffix A

The oil is the same as the gear box oil.

The hydraulic steering system has an automatic locking system. If you leave the wheel the rudder will not move, which is very convenient especially when changing sails and reversing. The system is equipped with an 80 kp/cm<sup>2</sup> pressure safety valve.

The standard inventory includes an emergency tiller. The tiller is a steel tube, length about 60 cm, and can be fitted directly to the rudder post. If you have to use the tiller remember to disconnect the rudder cylinder from the rudder.

"loose" rudder

"stiff" rudder

If the wheel feels "loose" or the boat doesn't seem to obey the helmsman, it may be due to lacking oil pressure in the steering system. If, for some reason, eg. lacking oil amount, the system contains air, the valves won't work and the rudder feel stiff

Throttle and gear remote control

When you move the lever you can feel three positions: Upright is neutral, forward is forward and backward is reverse. There is a  $10^0$  sector where the lever does not affect engine revolutions. In this position the engine is on idle, about 700 RPM.

Idle position

The gear is released by pulling the lever to the right and then moving it to the ahead position. The spring load will automatically engage the gear again in neutral position.

Engine stop

The engine of a NAUTICAT has an electric stop. The push button on the switch panel energises a solenoid which is fitted to the injection pump fuel valve. Reduce revolutions to idle for a few minutes, and stop the engine by pressing the button.

Technical specification

Throttle and gear lever (wheelhouse)	Teleflex A5 or Morse MT
Cables	Teleflex 401
Throttle and gear lever (aft deck)	Morse MIR
Cables	Teleflex 401
Engine room lever	Volvo 828164 Teleflex 401
Spanners for releasing the steering cylinder from the rudder	2 Off 24mm = 0.94 in

Coupled remote controls

The remote controls are coupled by means of the engine room lever. Refer to chapter 3.1.5 Starting for details.

How to remove air from steering system

To remove air from the hydraulic steering system you need a funnel connected to a 30-50 cm piece of transparent plastic hose. Apply the hose to the oil filling gap next to the mizzen foot. Fill normal transmission oil through the funnel and turn the outside steering to and fro. As the oil slowly enters, the air will come out as bubbles. Keep turning the helm until no more air comes out. Then squeeze the hose by the root and remove. Recap the filling gap. Mind! This is a slow procedure which takes time!

#### 4. ELECTRIC SYSTEM

##### 4.1 BATTERIES

The boat is equipped with 2 x 12 V/145 AH batteries. The batteries are installed in the engine room an parallel coupled (12 V = 290 Ah). Extra batteries can be fitted. A battery select switch is located inside the wheelhouse steering console. The switch has the following positions.

0 = off, except the bilge pump

1 = battery No. 1 switched on

2 = battery No. 2 switched on

Both = battery No. 1 and battery No. 2 switched on

##### Extra batteries

Extra batteries are parallel coupled to battery 2.

Check battery charge level and voltage often. Continuous high charging (more than 25 amps) or low battery voltage (less than 12 V) indicate faults in the system.

The battery water level should be checked every 14 days in hard use or even weekly. There should at least be about 5 mm ( $\frac{1}{4}$  in) of water above the plates.

Only distilled water should be added, preferably ionized.

Under no circumstances add acid.

When adding water, always clean the battery terminals and check the tightness of the terminal clamps. When not used for a longer period, the batteries will discharge. Diminishing voltage causes diminishing acid content, which in its turn raises the potential freezing point of the battery liquid. If the liquid freezes, the batteries will burst, possibly causing very serious acid damage in the engine room, plus the need for new batteries.

##### Frozen batteries cause acid damage

If the craft is not used for a period of 1-2 months the batteries will probably need a recharge. When you remove them from the craft during the winter storage, also recharge. Use a 10 A battery charger.

#### 4.2 CHARGING SYSTEM

A 12 V/75 A alternator is fitted on the port side of the engine. A voltage regulator is installed in an alloy box inside the steering console. The charging power is divided to the batteries according to their respective charging levels. Both batteries are always being charged, no matter which position the switch is in. The charging passes through a blocking diod system. If charging stops, a red light on the switch panel will alarm.

If the voltage in either battery gets very low, thus preventing starting, switch over for the other one and try again. If necessary switch on both batteries. Then let the engine run at 1250 RPM for about 15-20 minutes to let the batteries charge. Normally use only one battery at the time, trying to use each of them equally. This will make them last longer.

As a rule, use battery No. 1 for the starter motor, and battery No. 2 for other duty. Switch over from 1 to 2 when berthed. This will ensure you one full battery for the next start. Never trust battery 2 to be full, for it supplies the automatical bilge pump directly.

The batteries are a key factor to comfort on board - lights, water, heat, ventilation etc. - and for the functioning of the engine. Therefore monitor them often. Good care can make them last a good five years, whereas they will wear out in a couple of years if used carelessly.

Battery charger  
(on shore power/  
110 or 220 V)

As an option a battery charger is installed on board. The system includes a deck socket, a fuse box and a charger, (20-40 A/12 V).

The charger regulates the power automatically according to what is required. If the main switch is in pos. 1 it does not charge. In pos. 2 it will charge battery 2 and extra battery. To charge battery 1, as well, turn the main switch in position "both". When the red light is on, the charging is going on, when the green light is on, the batteries are full. The charger goes automatically when charging is required.

## 4.3 FUSES

All electrical circuits are protected by means of glass tube fuses, located on the switch panel. Open the fuse sockets by twisting the caps to the left. Circuits:

1. Navigation lights	}	10 A
Mast light		
2. Deck light	}	10 A
Compass light		
3. Anchor light	}	10 A
Horn		
4. Wipers		10 A
5. Fresh water pump	}	10 A
Sea water pump		
6. Refrigerator		10 A
7. Navigation instruments		10 A
8. VHF radio		10 A
9. Electronics		20 A
10. Cabin lights 1		10 A
11. Panel lights+Cabin lights 2		10 A
12. Cabin lights 3		10 A
13. Spare		10 A
14. Spare		10 A
15. Spare		10 A

#### 4.4 DETECTING THE FAULTS

Use a 12 V lamp connected to a three feet piece of twin conductor cable or some other similar device.

Checking the cables with this instrument shows how far the current passes and the defect can easily be located.

The most common fault is corrosion or poor connections. Deck sockets and fittings should be coated with petroleum jelly.

The battery terminals can be cleaned with a brush or a piece of emery paper. Apply grease when having re-connected.

#### CAUTION !

Always keep loose battery connection cables well away from the engine or fuel tanks, which are all earthed. If some of the batteries is still connected, a loose + connection may even burn a hole in a fuel tank .

#### 4.5 ZINC ANODES

The electric system and the engine and fuel tanks are earthed through the zinc anode, located on the exterior hull, next to the propeller. This device discharges the static electricity of the boat, thus preventing electrolysis to take place on the propeller shaft and other underwater metal parts. If the zinc anode wears out the discharge will take place through the other metal parts, causing electrolysis and consequently, corrosion. One season with an insufficient zinc anode will ruin the underwater metal parts. Therefore change the anode when the boat is hauled up for the winter, and also check the anode bonding cables, which have been run inside the hull.

#### Renew anode:

Change the hull zinc preferably once a season. Our authorized agent will get spare zincs for you or you have new ones made fitting the old measurements.

The engine manufacturer recommends a weekly check of the engine "pencil zinc" anode (c.j. Lehman Operator's Manual). We refer to the manual for engine zinc change. The zinc is located on the heat exchanger.

## 5. RIGGING AND SAILS

The masts are made of aluminum, with stainless steel fittings and stainless steel standing rigging and halyards.

The sails are of high class terylene.

In normal use, the following points should be kept in mind:

UV rays may damage sails exposed to strong sunshine. Use boom covers, but remember to dry the sails as soon as possible, when damp.

battens

The main and mizzen sails have battens. Insert the battens into their pockets on the sail edges, thin end first. Long ones in the middle, short ones above and below.

When storing the sails gathered on the boom, the battens can be left in their pockets, but remove them when stowing the sails into their bags.

dry damp sails! All the sails have their own, named bag. To avoid confusion, use the right bag. Avoid storing damp sails in their bags. Dry as soon as possible, e.g. by hoisting the sail loosely, upside down.

You will find more details on the use and maintenance of rigging and sails in the respective chapters.

## 6. BILGE PUMP, THROUGH HULL FITTINGS

### Bilge pump

A standard boat is equipped with an electric centrifugal bilge pump with a capacity of about 40 litres (9 gallons) a minute. The pump works either manually or automatically, controlled by means of a "man/autom" switch on the switch panel. The manual position is springloaded and will cut off the current as soon as you stop pressing the switch. In the automatic position the pump goes on and off depending on the position of a float switch in the bilge. The red warning light in the switch goes on when the pump starts working and goes off as soon as the bilge is empty. In the mid position the pump is switched off altogether.

### bilge pump check

Since the pump works very quietly it should be checked from time to time as follows: (two persons are required)

- turn the switch on "man". The red light should go on.
- if the red light does not go on, the fuse is tripped and has to be changed. Remember that the bilge pump is connected directly to battery No. 2, and has a fuse of its own located in the steering console.
- the automatic float switch normally turns off the pump when there is still some water left, and this water should now be expelled, if the pump is in order. Check at the scupper on the starboard top side, beneath the handrail gate.
- if there is water coming out for more than some 5-10 seconds, there may be something wrong with the pump or the switch. Check that there's nothing blocking the float switch. If not, the automatic function has been damaged and has to be repaired by a craftsman.

A manual membrane pump, capacity 30 litres (6,6 GB, 7,8 US gallons), can be fitted, normally on the aft bulkhead of the engine room - or under the aft companionway steps - , and led to an outlet beside the automatic pump skin fitting.\*

\* = through hull fitting

Through hull fittings UNDER WATER:

- Standard
1. Fore toilet inlet
  2. Fore toilet outlet
  3. Fore toilet wash basin outlet
  4. Sink outlet
  5. Engine salt water intake
- Optional
6. Aft toilet inlet
  7. Aft toilet outlet
  8. Salt water service system inlet
  9. Septic tank outlet

All submerged (underwater) through hull fittings (skin fittings) are equipped with brass seacocks.

## ABOVE THE WATER LINE:

- exhaust pipe
- automatic bilge pump
- manual bilge pump
- sea cooling water anti-siphoning vent
- Air heater (rubber plug)

Make sure you know all the through hull fittings and seacocks of your NAUTICAT. If there is a leak somewhere it can probably be fixed temporarily by closing some of the seacocks.

**IMPORTANT**

When sailing, always keep the outlet seacocks of the toilet wash-basins and the galley sink shut, in order to prevent sea-water from entering into the boat when it heels. During strong heeling the sink etc. will be under the water line.

## 7. WHEELHOUSE

The wheelhouse has been designed to function as the centre of all manoeuvring and navigation, with the exception of sheet and rig handling. Thus the helmsman has easy access to and control over wheel and throttle + gear lever, gauges, compass, switch panel, echo-sounder and sumlog dials, chart-table with lamp and, optional, autopilot panel, VHF-radio, electric compass dial etc.

The following items are accessible in the steering console:

- electric system main switch
- electric system main fuse
- electric system voltage regulator
- battery alternator diodes
- battery charging fuse
- bilge pump fuse
- wheel transmission adjustment (only for craftsmen)
- optional auto-pilot motor
- optional fuel emergency shut off cocks
- the air-heating unit is located under the portside-deck, accessible from the wheelhouse.

In the engine-room, beneath the wheelhouse you will find, besides the engine and powering equipment:

- 2 batteries; 12 V 145 Ah and optional extra battery
- the fresh water pump (in NC 33)
- 2 fuel tanks
- the optional sea water pump (in Nc 33)
- the optional Raritan water heater.

The gauge panel beneath the ceiling includes

- 2 fuel gauges, one for each tank
- gear-box oil pressure
- engine oil pressure
- temperature of cooling system
- engine revolutions
- battery charge current Amperes
- battery voltage
- engine running hours (cumulative)

One thing to remember when working at the chart table, especially when navigating with the compass, is never to place anything which might attract the compass too near it, eg. any iron and steel objects, transistor receivers, tape-recorders etc. It should be obvious that no loudspeakers, extra lights or other magnet-attracting gear should be installed where it might influence the compass.

Buzzer

On the instrument panel a buzzer alarms for danger limit in engine oil pressure and fresh water cooling system.

Alarm light

Alarm lights for charging, engine oil pressure and fresh water cooling system also on the panel.

The switch of the automatic bilge pump is on the switch panel.

Wheelhouse door keys

The locks of the wheelhouse doors are identical. Two keys are delivered, marked with the serial number of the locks. In case you should need spare keys, use the serial number for copying.

Do not slam the doors with force. They close easily if only unlocked and lubricated. Slamming will damage the locks.

It may occur that the buzzer starts sounding when the yacht heels strongly, due to the movements of the oil in the oil pan. This may not be dangerous at all, but if the buzzer doesn't stop sounding when the heeling has stopped, the oil pressure is lacking.

## 8. ACCOMODATION AND PLUMBING

### 8.1 GALLEY

The galley has been designed to be roomy enough for the cook, yet permitting action with a minimum of moving about, in port as well as off-shore. If cooking is intended in rough conditions it is advisable to install a support-belt to give the cook both hands free.

#### Equipment

- Double basined sink with cover hatch and taps for cold/warm water, and optional sea water, fiddled working space.
- Cutting-board, drawers, lockers, fiddles.
- Double-flame gas stove with oven, brand Upo or Eno.
- Electric refrigerator 52 liters (11,5 GB 13,5 US gallons), brand Engel, with silent swing motor (optional 90 l, 19,5 GB 23,4 US gallons).
- Optional ice-box beside sink, insulated stainless steel, 65 litres (14,3 GB 16,9 US gallons).
- Junkers water heater

The use and functioning of these items are explained later in this same chapter.

## 8.2 FRESH WATER SYSTEM

### Fresh water tank

The tank, made out of polyethene plastic and taking 250 litres\* (55GB, 65US gallons), is situated under the saloon floor, accessible through hatches.

Clean the tank and check the water level through the twist cap on the tank.

The tank filler is on deck, on the port side, marked "water". When filling check the air vent on the starboard topside. As soon as there is water coming out of the vent stop the filling. Do not push the water hose down the filling pipe. This causes back pressure in the tank and the saloon floor may even lift slightly. Release the tank pressure by opening a fresh water tap and letting excessive water run out until the floor has settled back.

### Additional water tank

An additional 100 litre (22 GB, 26 US gallon), polyethene water tank can be fitted in the bow under the forward cabin berths. This tank has its own filler on deck, port side, marked "water". The tank can be cleaned by opening the cap, like the main tank.

You can select either tank by means of 3-way cock under the saloon steps. The positions of the cock are marked FWD (additional tank) and Main (main tank).

Due to possible remains of the manufacturing process a new tank may give a certain taste to the drinking water. We flush the tanks before installation, but in the beginning we advise you to use much water for washing and cleaning up etc. in order to get frequent refillings, and to get rid of the taste.

### CAUTION Get the air out!

When filling the tanks, always expel possible air from the system, especially the warm water branch, by opening the service taps and letting the air out until the water starts running.

\* in yachts built in the spring 1983 and later: 450 l.

Water pressure  
pump

The water pressure system is operated by a belt driven, automatic diaphragm pump, controlled by a built-in pressure switch which turns the pump on when the pressure is lower than  $1,5 \text{ kp/cm}^2$  and off at  $2,2 \text{ kp/cm}^2$ .

If the pressure of the water system fails, when the "fresh water" knob on the control panel is pulled out, it is possibly due to the pressure switch. A light tap on the red or black switch housing may help, but if not, the switch has to be replaced.

Pipes and hoses

Filling-, vent- and water pipes are made of PVC plastics. Since the tank has no filter make sure that no dirt gets in the pipes when filling.

The tightness of the hose clamps at joints and fittings should be checked from time to time. You notice leaks in the water system from the fact that the pressure pump runs 1-2 seconds at even intervals even when no water is used. If some tap seems to lack pressure undo the filter gauze of the tap and clean it. If the pressure of the entire system is low in spite of normal pump functioning consult your Nauticat representative.

Warm water systems

Two different water heaters can be installed in a NAUTICAT, either a gas heated Junkers or an engine heated Raritan.

Junkers gas operated Use:

water heater, type  
W 125

- check that the "fresh water" switch in the wheelhouse is on
- open the valve on the gas bottle
- check that the gas valve of the water heater, under the sink is open. The handle should be in line with the pipe.
- turn the water control (the bottommost knob) counter clockwise to its extreme and expel possible air from the warm water taps.
- push the flame regulator to the "two-flame" slot position and push it in for about 20-30 seconds
- push the right hand firing knob in, possibly several times until the pilot light is lit. Keep regulator knob in for 10 sec.
- when the pilot light is on push the flame regulator all the way to the right

- Regulate the flame with the regulator knob.  
Big flame right, small flame left.
- turning the water control knob counter clockwise increases the water amount and turning clockwise decreases it.

The most economical positions are: flame in the middle and water amount small. If you use the shower both flame and water amount should be at maximum.

The pilot light is always burning when the heater is on duty . The flame can be turned off by pushing the flame regulator to the left. The pilot light has an automatic flame guard. When you hear a slight snap about 15 seconds after turning the light off you know that the flame guard works properly. As a safety measure the gas valves can also be shut off.

**CAUTION**  
Get the air out!

If the air is not properly expelled from the fresh water system, and particularly the warm water branch, the low water pressure will turn the heating flame on although no water is used. The heater will be overheated, and may become the start of a fire on board. When you notice that you are about to run out of fresh water, turn the heater off immediately. It absolutely requires proper pressure for safety.

#### Raritan water heater

A NAUTICAT may be equipped with an optional Raritan water heater, a well insulated container (taking 25 litres = 5,5 GB, 6,5 US gallons) through which the engine cooling water circulates in a spiral. The water in the container gets as hot as the cooling water of the engine. The temperature can be seen from the engine temperature gauge. The water will remain warm over night, (the temp falls about 30<sup>0</sup>C, though) and is hot again after running the engine for five minutes. This heater is always ready for use, and it requires no operation. It is installed on the port side of the engine bay. As an option the Raritan heater has a 220 V heating unit which can be connected to shore power. The unit has a thermostate control (90<sup>0</sup>C).

Shower

An optional hand shower can be fitted in the forward or aft toilet. The length of the hose is 1,4 metres. On the handle there is a knob which switches the water flow from faucet to shower. From the floor drain the water runs through a hose to the lowest part of the bilge, from where it is pumped out by the bilge pump. Check that the switch is in "autom" before using the shower.

Salt water pump

A salt water pressure system, mechanical or electrical, can be installed as an option. In both cases the pumps have their own through-hull fittings with seacocks. If the system includes a P.A.R. pump an additional switch is fitted on the switch panel.

The pump starts and stops automatically in the same way as the fresh water system. The outlets can be chosen, the possibilities are: galley, fwd deck and aft deck.

The deck outlets have ball valves, which open automatically when you push in the counter valve of the deck hose.

Gauge

The optional water gauge is fitted on one of the lockers of the galley. It works only when the ignition key is turned on.

### 8.3 SANITARY SYSTEM

Both toilet compartments are fitted with a Lavac water closet. It works on the suction principle and therefore it is very important that the seals of the lid and the seat are clean. The system does not work if the lid or the ring is broken.

#### WC operation

There is about 1 litre ( $\frac{1}{4}$  gallon) of water in the bowl. Close the lid and press it slightly, then pump 8-10 strokes. Due to vacuum salt water enters the bowl through the supply (narrower) hose. Wait 5 seconds and pump about 10 more strokes. The vacuum keeps the lid closed until the pressure has diminished. This takes about 30 seconds. When the pressure is released you can lift the lid and pump superfluous water out of the bowl. If the bowl is empty and you want to have water in it just close the lid and pump 10 strokes. Wait until the pressure is diminished and the bowl can be used again. The supply hose has a bend above the waterline before it is connected to the bowl. The upper point of the pipe has an air vent which prevents siphoning back.

Never force the lid open. It will loosen the seals and make the vacuum less efficient.

If the water level in the bowl tends to be too high, you can lower it by making the anti-siphoning vent bigger with a hot needle.

The intakes and outlets of the water closets are fitted with seacocks under the floors of the forward and aft cabins. The wash basin outlet seacocks are in the same places.

The thin plastic hose: toilet supply

The thick green hose: toilet outlet

The thick transparent hose: basin outlet

Never flush foreign bodies (matches, pins or sanitary pads) down the bowl. Soft absorbent toilet paper should be used.

Septic tank

If the boat is fitted with a septic tank (made out of acidproof steel) there is a 3-way cock next to the bowl, which selects emptying either into the tank or the sea. The tank is large enough for about 20 operations.

When on the open sea the tank can be emptied with a mechanical pump after the seacock under the tank has been opened. Rinse the tank after each emptying by pumping it full and emptying it a couple of times. This will lessen the risk of clogging very much.

If you want to eliminate vapours due to gas expansion in the tank, we recommend Natriumhypochlorite ( $\text{NaClO}$ ), which will also dissolve the toilet paper to a certain extent, and lessen the risk of clogging. Consult your pharmacist, who will supply you with the substance and instructions for how much to use. Do not add it into an empty tank!

We do not recommend the chemicals intended for caravan toilets, since they strongly contribute to pollution of the sea. The  $\text{NaClO}$  will react in the tank and turn into table salt.

**IMPORTANT**

After use at sea, empty the bowl completely by pumping a few strokes the lid open, in order to prevent splashing due to the movements of the boat.

#### 8.4 HEATING

The air heating unit, an Eberspracher, is located under the port side deck, accessible from the wheelhouse. The control switch is on the wheelhouse inside wall, port side.

The exhaust pipe is led through the port topside, beneath the steps to the poop deck. It has a rubber plug, attached to a chain.

The rubber plug should be used when sailing with the heater turned off. When it is turned on, the exhaust pipe can be under water temporarily without the heater going out. Water entered through the exhaust pipe when the heater is turned off will damage the unit. Under normal circumstances rain will not enter an unplugged exhaust pipe.

Always check that the plug is out before you turn on the heater.

During winter storage the exhaust pipe should be plugged.

Check the thermostat!

The thermostat, located in the aft cabin, controls the ignition circuit of the heater. Therefore, the heater won't ignite if the thermostat is set for a temperature lower than the prevailing one. Check the thermostat before turning on the heater!

CAUTION

Mind the burning hot exhaust gas coming out of the exhaust pipe on the port side, specially with regard to neighbouring boats and fenders. A plastic fender will melt from the heat.

On the following page, we have gathered the most important points concerning the use and maintenance of the unit.

optional

The warmth of the engine may also be used for heating the boat. Radiators, installed under the seats, are connected to the engine heat exchanger. The system comprises an expansion tank, through which, in the case, the engine cooling water is filled.

## E Operating Instructions:

40.

The heater must never be on while the tank is being filled.

The heater must never be operated in garages.

Operation with universal switch

Ventilation

To switch on:

Turn knob to  $\bigcirc$  position. The control light in the knob glows.

To switch off:

Turn knob to 0 position. The control light goes off.

Heating at full capacity:



Set the control to  $\bullet$  (Full). The pilot lamp on the switch will come on. The heater will commence functioning after a maximum of 5 seconds.

The knob should be switched to "0" when the heater is to be switched off; the pilot lamp will go out. The blower motor continues running until the heater has cooled; it will then be switched off automatically.

Maintenance:

Even when the heater is not in constant use, it should be switched on for a brief period approximately once every month.

You can rectify the following faults yourself:

1. If no sound is emitted by the blower after switching on:
  - a) Check the 16 A fuse in the cable harness of the heater.
  - b) Check the motor fuse in the control unit.  
Important: Only the following Eberspächer spare part fuse inserts (special monitored design) may be used:  
for 12V fuse insert TT 4,  
blue marking,  
no. 460 26 016  
for 24 V fuse insert TT 2,  
yellow marking,  
no. 460 26 000  
The use of other fuse inserts may lead to damage in the control unit in the event of a fault.
  - c) Check the glow plug. Change if necessary.

2. The blower runs for only 3 minutes after switching on, the heater does not ignite and switches off automatically:

Switch the heater on and off briefly (not more than twice). If the heater still does not ignite, have the trouble seen to in a workshop.

3. After switching on, the blower only runs for some 20 seconds, the heater does not ignite and switches off automatically:  
Check battery voltage. If voltage  $< 10.5$  V or 21 V, the undervoltage safety device has responded.  
Charge battery, switch heater off, then back on again.

4. The heater goes off during operation or automatically switches off 5 seconds after being switched on:

The fault is due to overheating. Switch off the heater, remove the cause of the overheating (e. g. blocked hot-air line), press the knob of the safety thermal cutout switch and switch the heater back on. If the heater still does not ignite, have the trouble seen to in a workshop.

Please ensure that the heater begins to function approx. 2 to 3 seconds after it has been switched on. The pilot lamp on the universal switch comes on immediately

**CAUTION** Never turn the boat's main switch off before the blower has stopped working automatically. Otherwise the unit may be severely damaged.

## 8.5 GAS SYSTEM

The gas system of a standard boat comprises the following parts.

1. Gas bottle storage on aft deck, containing a gas bottle with a shut-off valve and flexible hose connected to the gas piping. The gas bottle storage is ventilated through the topside.
2. The gas piping is made of 10/12 mm copper, running unbroken from the stern to the closet under the sink, where a separate shut off valve is fitted. The optional Junkers water heater has its own shut off valve on the right hand side of the closet. The flexible hoses shall be renewed according to national rules.
3. Stove: The UPO-Nautiwall stoves have automatic failsafe valves fitted. The flame guard prevents the gas from flowing if the flame has gone out. When lighting a flame, push the respective knob for about 10 seconds to release the flame guard, then light. To light the oven, push the oven knob in for 10 sec. and hold a match to the front hole in the middle of the base plate.

To prevent accidental gas leaks, always shut off the gas valves under the sink, and for optimal safety, the main valve at the gas bottle. But remember, that the risk of gas leaks and consequent gas accumulation on the floor and in the bilge can never be altogether eliminated, wherefore caution is required. Remember that gas on the floor does not smell at the level of one's head.

### IMPORTANT

Always check, when taking the boat into use after delivery or winter storage, that the rubber hose between the gas piping and the gas stove is fastened in both ends. If you hear gas rushing or wheezing out when you open the gas tap of the stove (or other gas operated device), close the tap immediately, for there is obviously a leak. Locate the leak with the assistance of a craftsman.

## 9. HOW TO SAIL A NAUTICAT

### 9.1 HOW TO USE THE MACHINERY

#### General

By and by you will learn that there is a certain speed range where the engine "feels" right, due to its specific vibration. With the comfort of the engine and the crew in mind we recommend speeds between 1750-1950 RPM.

Speed table NC 36 (fictitious)	RPM	Speed knots	Fuel consumption/h			Relative consumption 1/M
			litres	GB gal	US gal	
	900	5,0	5,0	1,1	1,3	1,00
	1200	6,8	6,7	1,5	1,7	0,99
	1500	7,5	8,4	1,9	2,2	0,99
	1800	8,0	9,5	2,1	2,5	1,00
	2100	8,5	13,0	2,9	3,4	1,20

The table is based on the tests we have undertaken with the proto-type. No two engines perform exactly the same, but the facts above should give you an idea of how much fuel your yacht is likely to need.

Do not run the engine on maximal revs. i.e. about 2300 - 2400 revs. with a standard propeller. This will increase the boat speed only 0,25 knots in relation to 2000 - 2100 revs, but raise fuel consumption very high. At 2000 - 2100 the fuel consumption is still reasonable. At a speed of 9,5 knots it is almost optimal.

When switching from forward to reverse, or vice versa, make it a rule to wait about one second in neutral before changing gears. This procedure diminishes the strain on the entire power transmission, since the propeller shaft can slow down before the gear makes it rotate in the opposite direction. Do not use more than 1700 revs, when reversing.

When in port after a long trip let the engine run on idle for about five minutes to let the temperature and lube oil circulation settle. Always remember to turn the propeller shaft greaser

handle about 180° after each ten hours of use, or after a day's journey, although it hasn't lasted quite that long. If 2-5 drops of water a minute seep out of the shaft bearing everything is still in order. When in port for a longer period you can stop the water almost altogether by turning the greaser handle until it feels tight. Very little water will then pass through. During the break in period, (and always when setting out to sea) check the cooling water level, the oil level and the tightness of the alternator belt ("fan" belt) frequently.

#### MACHINERY TROUBLE

At several earlier points we have mentioned possible complications in the machinery. We therefore refer to the Ford manual fault finding chart and the margin notes such as engine trouble, if the gears do not work, check the following points etc. in the respective chapters. But we shall mention a few more points which may be useful to know.

As a rule, always remain calm when something unusual happens. The actual damage may be quite small, but hasty and thoughtless decisions may make it a lot worse. And remember, that even though the engine should fail altogether, you still have your sails, and anchors, to secure you. It is a well-known fact that sober judgement and good sails will take you through practically any kind of weather. Only remember always to respect the force of the wind and to reduce sails when necessary.

#### Engine stop

If the engine stops, check the fuel situation. You are probably out of fuel. But air bubbles in the fuel will also make the engine stop for sure. So will water, and therefore check the water separator. Clean, if there seems to be water in it, and bleed the system. It may be worthwhile to bleed it anyway, although nothing clearly indicates air or water in the fuel, since polluted fuel is practically the only thing that will stop a running diesel engine. It does not take long if one has some experience. As a rule, you should be familiar with the bleeding procedure, for it is one of the routine service measures to be taken at even intervals, and that any diesel engine requires.

Alternator  
= "fan" belt  
failure

If the fan belt breaks the charging will stop immediately. The red warning light will go on, but remember that the fresh water cooling system pump is driven by the same belt. This means that the engine will go hot pretty soon. Reduce revolutions to almost idle, hoist the sails, stop the engine and replace the broken belt.

Leak in the  
fresh water  
cooling system

If the engine fresh water cooling system gets a leak the engine temperature will rise and turn on the alarm buzzer. Stop the engine immediately and open the hatches. Hoist the sails.\* Opening the refilling cap is dangerous since the system is full of hot steam which will spray out with a great pressure. Therefore, wait a good while and cover the lid with a piece of solid cloth and plastic when unscrewing the cap. If you have hot water available you can refill. If not, let the engine cool down thoroughly and then refill with cold water. While waiting, try to locate, and possibly, mend the leak. If not successful, leave the hatches open, if using the engine, and try to get to the closest service facility to get some help.

\* first check that the overheating isn't due to clogged sea-water cooling system. Refer to ch.3.1.1.

## 9.2 CRUISING UNDER POWER

Remote control  
into neutral  
when changing  
steering  
stations

A NAUTICAT motorsailer has two steering stations with remote controls to permit steering outside as well as inside. One thing to remember about the remote control is always to return the lever into neutral when changing from one steering point to another. If one remote control is engaged, the other one won't work. This may lead to very serious complications e.g. in case one should need to stop the boat abruptly.

The turning radius of a NAUTICAT is very tight at low speeds, particularly when turning to port. The propeller rotates counter-clockwise, viewed from astern, causing the stern to slip to starboard. Turn the wheel hard to port and run the engine at 1500 revs forward and reverse alternatively. The boat will turn about  $90^{\circ}$  to port at each phase. Try this at sea. Also try turning to starboard, and note the difference. A life buoy in the water can serve as a comparison mark.

A NAUTICAT has a heavy displacement, wherefore caution must be observed when berthing. Make it a rule always to have all the fenders out and all the mooring lines ready when docking or coming alongside.

You will notice that the stern "draws" to starboard also when reversing.

### Setting off

When setting off, make it a habit to try the gears at a low speed. Switch over to FWD and reverse and note a slight jerk when the gear is engaged. Do this while the mooring lines are still attached. Always use minimal speeds in port!

### Berthing

The safest and easiest way of berthing is wind on the bow and pier on starboard. Thus you take advantage of the slip-effect of the stern. Approach the pier in a  $30^{\circ}$  angle, at a speed not higher than what is required for manoeuvrability. When the bow is about two yards from the pier, turn the wheel to its port extreme, and when the bow is about to touch the pier, put in the reverse. Now the bow will move further off the pier and the stern closer, thus bringing the craft alongside.

The wind direction dictates the order in which the mooring lines should be fastened. If the wind is on the bow, attach the bow first, if it is on the stern, the stern first. Loose line ends should, according to good seamanship, be gathered on board, not on the pier.

If you have to change the moorings in bad weather, or otherwise the craft would seem tough to handle, remember that the genoa winches can be of help.

### Changing berths

If the wind lies on the pier where you are attached and you have to change berths, the safest way to do it is to steer the stern off the pier while the bow is attached. Double the bow-line and control it from aboard. Check that you have enough fenders on the bow. Turn the rudder hard to the pier side, undo the other mooring lines, and push the remote control lever gently into forward. Slowly the stern will move off the pier. When the boat is at a  $40^{\circ}$  angle to the pier, put in the reverse, gently turn the rudder midships. Release the mooring line, and reverse carefully off the pier. Remember that the strain on the steering mechanism is great in reverse, so use low speed and moderate rudder angles, as much as possible.

### Log and distance recorder

We recommend you to determine the actual speed of the boat by cruising a measured distance at a certain RPM rate and divide this distance with the time it takes you to complete it. This will give you the actual boat speed at that particular RPM. Mark the log and distance recorder readings and put down the following facts in a table. Also note wind and sea conditions.

### Coefficient table (imagined)

RPM	Distance M	Time min = hours	Actual speed knots	Log speed knots	Log speed coefficient
1600	12	84 = 1,40	8,6	8,8	0,98
1750	12	80 = 1,33	9,0	8,9	1,01

Distance recorder reading	Distance recorder M	Notes
---------------------------------	---------------------------	-------

13	0,92	heavy sea
13	0,92	wind on the bow 8 knots

Aided by the coefficients one can use the distance recorder and the log pretty safely. Unless having made up this table, do not trust the accuracy of these instruments. Try, if possible, to use one and the same measured distance, and remember that the longer the distance and the more carefully you measure it on the chart, the more accurate the results.

Distance recorder  
coefficient must  
be correct

The log speed reading coefficient is not very important, but the distance recorder reading coefficient must be accurate to give safer navigation. Incorrect distance calculation in conditions of poor visibility may be disastrous. Therefore, check the recording with the actual distance as often as possible. If the recording bias grows, it is probably due to dirt in the impeller.

The log impeller, which also gives impulses to the distance recorder, should be checked at every possible occasion. Clean the sunlog impeller when swimming and diving around the boat. The impeller of an electronic log can be cleaned from inside the boat.

Navigation

It is not our intention to give you a lesson in navigation here, but we remind you that keeping your log coefficient table and compass deviation table up to date will make cruising safer and more enjoyable.

Manual stop

Should the stop-button on the switch panel not work, the engine can be stopped by moving the stop lever of the injection pump, the current being switched off. (Ford man. p.28, fig.17. Stop lever beneath filler plug)

### 9.3 OPERATION UNDER SAIL

The NAUTICATs are motorsailers, differing from pure sailing yachts chiefly in the greater emphasis on comfort and roominess, and in being equipped with a more powerful engine. Thus the hull shape is slightly more bulky, the displacement a bit greater and the sail area somewhat smaller. This naturally affects the sailing performance to a certain extent, but in good hands a NAUTICAT sails very nicely. It is all a matter of skill and experience.

In this chapter we shall try to bring our experience to your disposal.

The main principle when sheeting is to fill the sail with wind. If the boat moves perpendicularly to the wind or upwind, ie when reaching and beating tighten the sheets to get wind, but slacken them again until the luff begins to curl. Then tighten slightly. When running dead downwind the sails should be as perpendicular to the wind as possible.

#### Sheeting point of jib

The sheeting point is important, especially when beating. When the jib is sheeted tight, the foot should not be stretched tight while the leech is fluttering. This happens if the sheeting point is too much aft. Alternatively loosen the sheet and move the traveller forward, until you find the right position. The leech should be stretched and the foot slightly curved, i.e. the foot should have a slight belly. Do not, however, push the trav. too much forward, for this will only strain the leech and give too much belly.

#### Sheeting point of main

The main sheet also has a sheet track. If you pull the traveller to the windward side the leech will get a belly, and if you take it down leeward the leech will straighten. When tacking do not attempt getting "higher" to the wind by moving the traveller windward. Take the traveller leeward and pull the sheet tight. This will straighten the leech, and give the sail a favourable shape. Tighten the kicking strap to save some strain on the sheet and leech. The best shape for tacking is obtained

when taking in one reef (if the boom is equipped with slab reefing) and adjusting the belly with the reefing line.

### Gybing

When running downwind, attach the kicking strap to the cap shroud, to avoid the risk of unintentional gybing, i.e. when the boom slams over from one side to the other. This may carry away your entire rig, if the wind is strong enough. When running, try to sail "butterfly" i.e. "wing and wing", or to use a spinnaker.

### Hydraulic steering

All NAUTICATs built after 1981 have a hydraulic steering system, which means that the helmsman doesn't "feel" whether the yacht tends to steer upwind or downwind. He may be steering to starboard or port while she goes straight forward. In this case the rudder "brakes" the speed. The ideal is to obtain a balance in the sails which will move the boat straight forward when the rudder is straight. Therefore, a rudder angle indicator is a good option, if you want to sail better.

### Balance the sails to get more speed

As a general rule all sails forward of the main mast make the yacht turn downwind and all the sails aft of it make her turn upwind. Thus, sailing is a matter of balancing these two forces. The mizzen, in particular, makes the yacht turn upwind, and the bowsprit genoa does the opposite. Normally trim the main and genoa before the mizzen. The schooner mainsail has to be used with a good "counterpoise" in the fore mast. It is also obvious that it has to be reefed fairly often, but with a good slab reefing this is a quick operation and will give you better possibilities for adjusting the sail.

When sailing to windward, the wind, lying on the high freeboard and cabin of a NAUTICAT produces a certain leeway. If the sails are properly sheeted she, however, cruises nicely, especially in fresher winds. Do not attempt to "pinch" too much upwind, you will only lose speed and yet more leeway. Try to find an optimum where the speed, course and leeway bring you fastest to your goal. When the yacht heels more than about 15° it is time to reef. Excessive heeling angles also produce more leeway and less speed.

### Sailing in light winds

When tacking in light winds with a NAUTICAT you may have to help her turn by releasing the genoa only when you have gained the new tack. I.e. do not loosen the genoa sheet before the turn, but after. The wind on the "back" side of the genoa will make the bow fall downwind, and thus make the yacht turn faster.

We advise all NAUTICAT owners, who do not own very much previous sailing experience, to try all the sails in light winds first, and learn how everything works.

### Sailing in fresh winds

A NAUTICAT is at her best at fresher winds. In such conditions she can compete with regular sailing yachts, if skippered skillfully. Finding the right sail balance is even more important now. The yacht will probably steer upwind, wherefore the mizzen often can be lowered, being more or less superfluous at this stage. In the following we shall give you some advice on how to reef the main and how to reduce the sails in fresh winds.

### Reducing the sails, reefing

Normally, start with lowering the mizzen. Then you can either reduce the fore sails or the main, depending on whether the yacht steers up- or downwind. As a rule, one foresail is enough when the mizzen is down.

### Reefing

If your NAUTICAT has roller reefing, reduce the main by rolling in three or more turns. Remove the kicking strap from its slot, first.

If she is equipped with slab reefing, make it a habit always to have the reefing lines applied in the reefing mechanism (see the Seldén drawing).

Reef as follows:

- loosen the main sheet to eliminate wind pressure in the sail
- loosen the kicking strap
- tighten the boom lift if loose
- slacken the main halyard until you can hook the first reefing eyelet on the gooseneck reefing hook
- re-tighten the main halyard until the eyelet won't come off the hook

- tighten the reefing line

The boom is prevented from falling down on the deck by the boom lift. Tighten the reefing line either by hand or using the reefing winch on the boom.

When the reefing line is fastened to its cleat on the boom, you can tighten the main halyard a bit more if necessary, and adjust the belly by slackening or tightening the reefing line. Re-tighten the kicking strap, but not as hard as under full sails. Sheet the main, and gather up the superfluous sail area to the boom using odd line ends through the holes in the sails. Unless it flutters it can also be left hanging freely.

Should the wind increase, change the foresail to a smaller one, then take in one more reef in the main, then change foresails again until the storm jib.

Never stretch the boom lift so much that it will be stretched when the main or mizzen is sheeted tight, but let the leech of the sail take the weight of the boom.

Cruising under sails and power simultaneously

When cruising under power the mizzen is useful as a stabilizer in heavy seas. Sheet it rather tight. If, however, it steers the yacht upwind, lower it and hoist the main (if necessary, reefed) for the same purpose. As a rule, the sails must be tightened a bit more, when motorsailing.

A NAUTICAT will behave smoothly in heavy weather if you run the engine at about 1400 revs and use the main with two reefs as a stabilizer. Alternatively, you can use the mizzen and jib or storm jib together. On the schooner, the midship staysail is a good stabilizer. Remember, that the storm jib, as a last resort, can also be hoisted midships, if it tends to pull the bow downwind.

Spinnaker equipment

The spinnaker can be used in lighter winds coming from any

direction aft of abeam. It needs the following equipment:

- ring or traveller on the mast for fastening the spin pole (=spin boom)
- spin pole with lift and down-haul lines
- down-haul block on fore deck
- spin halyard
- two non-elastic sheets
- two extra blocks at the stern of the boat, as far aft as possible, one on each bulwark
- two extra winches (not indispensable)
- jockey pole (not indispensable)

### Hoisting the spinnaker

When hoisting, blanket the spin with the genoa. Hang the spin pole on its hook, fasten lift and downhaul, and pull them tight, adjusting the pole into horizontal. The spin pole should be on the windward side of all the forestays, i.e. the opposite side in relation to the main boom. Fasten the spin bag to a stanchion under the genoa. Fasten the sheets well to the spin corners (=clews), and pull the windward sheet (= the "guy") through the hook in the fore end of the spin pole. Pull the guy outside all stays and shrouds to the windward block and winch. Pull the leeward sheet to the leeward block and winch, outside the shrouds. Attach the sheets to their clews by the winches. Fasten the spin halyard to the head of the spin, seeing that the halyard runs freely outside the genoa (on its leeward side).

Now you can hoist the spinnaker. Do it with two turns around the halyard winch, steadily, without interruptions, as fast as possible. Try not to make the sail catch air before it's fully hoisted, i.e. stretch the sheets only moderately until the sail is all the way up. Fasten the halyard carefully to its clew.

As soon as it is up, the sail may fill with a slight bang, or start to flutter. Slacken the leeward sheet and tighten the guy until the sail fills. Go on slackening the leeward sheet and tightening the guy until the luff curls slightly. Then slacken the guy just a little. Now the spin pole should be

about in line with the main boom, the sail not touching stays or shrouds or other sails. If the sail flutters in either edge, slacken the sheet of that edge.

If the sail foot is not quite horizontal, adjust it by raising or lowering the spin pole. When hoisted during reaching, the spin will need less adjustment. It will fill more easily, and can be adjusted mostly by the leeward sheet. The use of a jockey pole will prevent the guy from resting on the fore stay and genoa furling track, and also prevent it from chafing on the cap shrouds.

If the spin doesn't get enough wind behind the genoa, lower the genoa by first sheeting it tight and then letting go of the halyard. The sail will drop inside the guard rail without much attention. If your NAUTICAT has a furling genoa, furl it in.

The golden rule when sailing under spinnaker is to have the spin pole and boom in line, perpendicular to the apparent wind direction.

#### Twisted spinnaker

If the spin gets twisted when you hoist it, try to untwist it with slight jerks at the leech. If this doesn't work, lower the sail, untwist it, and try again. Make it a habit to try to avoid twisting it when bagging, and to check that it is OK before hoisting, by running down the edges with your fingers. BEWARE NOT TO GET THE SPIN INTO THE WATER.

#### Lowering the spinnaker

Hoist the genoa or furl it out, to blanket the spin. Check that the spin halyard can run freely through the mast. Turn slightly to the wind, while slackening the guy and tightening the leeward sheet. Release the guy from the sail, which will fly out to leeward. Gather the foot of the sail to the wheelhouse door. Lower the sail while the person who gathers the sail into the wheelhouse tells the person at the halyard how fast to let go. (If you let go too fast, the sail will drop overboard). Adjust the genoa. Undo the spin halyard and fasten it to the spin ring on the mast. Undo the spin pole.

Bagging the spinnaker

Run down both edge tapes with your fingers to make sure the sail isn't twisted, and stow it beginning from the belly, loosely, without folding. Leave the clews (spin corners) and head on top, and pull a line through the eyelets. The spin will be ready for instant use again, if stowed like this.

Gybing

When running downwind, and changing course slightly, the sails may seem to be on the "wrong" side. You can switch them over, "gybe" them, by tightening the sheets, so that the sail is stretched midships, and gently letting the wind in from the other side. Then slacken the sheets. Avoid gybing in fresher winds, for the bang may damage your rig. Gybing a spinnaker of the NAUTICAT size takes experience, and we advise you not to try without having someone experienced on board.

Staysails

The mizzen staysail and the schooner fisherman staysail can be used when having the wind from the same side for a longer period. Particularly the fisherman will give the schooner considerably more speed, making up for the lacking spinnaker possibility.

Propeller shaft lock

You will notice that when the boat speed exceeds two knots under sail, the propeller and propeller shaft start turning. If the noise disturbs you, you can install a shaft lock. This will, however, "brake" the speed a little.

IMPORTANT

When advancing swiftly under sail, and the propeller shaft is turning, run the engine for about 10 minutes every 4-5 hours to cool down the gear-box oil. The hydraulic pump, as well as the sea water pump are driven by the engine shaft, wherefore the engine must run (on idle or forward), to make the sea water pass through the gear-box oil cooler and to make the oil pass from cooler to bearings.

This section concerns NAUTICATs previously used, as well as new ones.

## 10. LAUNCHING AND FIT-OUT

Before launching, check the following:

- oil levels of the engine and gear-box
- engine fresh cooling water level
- sea water cooling system; the pump impeller in its proper place, draining taps closed, hose connections tight. \*
- fuel system water separator ("water trap filter") free from water (ch. 3.2.1)
- that the greaser handle is turned until tight
- that all batteries are connected (red=+pole)
- that the sumlog impeller turns freely
- that no anti-fouling has been applied on the echo-sounder transducer, zinc anode, propeller, or propeller shaft
- that rudder and wheel are in order

### 10.2 LAUNCHING

Launch the yacht with a crane according to the appended drawing "docking plan and cradle". Slip the slings under the guard rails, and use pieces of smooth wooden board to protect the wooden toe rail on the bulwark. If no such board are available, use spreaders to keep the slings apart outside the guard rails.

### 10.3 RIGGING

Fasten all bottle screws to their respective chain plates. Open them to their maximum, and remember that they should tighten clockwise, i.e. the same way as the lay of the wire.

Fasten the main mast spreaders. Apply the pegs with the cotters down. Fasten and tighten the intermedium shrouds. (Check whether your NAUTICAT has such shrouds with the rigging

\* seacock under strainer opened

specifications). Install the cap shrouds so that the spreaders get into the angle indicated on the mast. Make sure that the cap stay is in its proper place, and that possible aerials and wind meter sensors have been installed. Check all mast lights, electric connections, wires and sockets. Check the condition of the halyards, especially the splices between rope and wire. Also check the halyard sheaves in the mast head.

If the crane is high enough, slip the lifting rope through the head eyelet of the mast. If it isn't, tie the rope around the mast underneath the spreader roots. When lifting from the spreaders, attach a rope end to the heel end of the mast, and hold tight, for the mast will swing.

Fasten the stays and shrouds in the following order: forestay, cap shrouds, back stays, lower shrouds (schooner in an equivalent way). Attach the electric connections to their sockets.

Lift the mizzen correspondingly. Connect the triatic stay between the masts.

Install booms and sheets.

Use the facts given in the mast and rigging specifications, and the drawing on the Standard specification brochure, to help you. Before striking the rig in the autumn, you may mark corresponding stays and chainplates in order to get a faster rigging in the spring.

### Mast trimming

The rig can be adjusted into various mast angles and mast bends, according to the characteristics of the sail. We gave you some basic advice as to sail trimming in the sailing chapter, but in order not to make these pages swell out too much, we kindly ask you to consult a suitable guide book (eg. Seldén) for more details in mast trimming. Good trimming needs a bit of initiation, but in return it may raise sailing performance considerably.

Never leave bottle screws without cotters Always make sure that no bottle screws are uncottered, and make it a habit to have spare cotters at hand. Bottle screws which have unscrewed have caused many mast failures. Always cotter at once after adjusting.

## 10.4 POST LAUNCHING CHECKS, TRIAL

Bleed and start the engine (ch.3.1.4 and 3.1.5), and check the following:

- engine oil pressure 3,5-4,0 kp/cm<sup>2</sup> (50-60 lbf/in<sup>2</sup>)
- gear-box oil pressure 7,5-9,6 kp/cm<sup>2</sup> ( 105-135 lbf/in<sup>2</sup>)
- that the ampère meter indicates charging
- that the voltage gauge dial reading is 13.8
- that the charging warning light goes out
- that the sea cooling water flows, i.e. that water passes through the strainer or trickles out of the exhaust pipe
- that no water enters into the bilge. If it does, locate the leak.
- that no odd noise is heard from the machinery

Leave the engine room hatches open, while doing the following:

- turn on the air heater, and check its functioning (ch.8.4). Let it work for about two hours to get rid of the smell of new paints that new units emit, and the foul smell that sometimes tends to follow winter storage.
- fill the water tank (ch.8.2). Check all taps. If your NAUTICAT is equipped with a sea water service system, check the sea water taps or spouts. If she has an additional fresh water tank in the bow, check the three way cock and see that the pump works on this circuit.
- check that the WC bowl rubber packings are clean. Check the functioning of the toilet (ch.8.3)
- test the stove (ch8.5) and the Junkers water heater (ch.8.2)
- check the functioning of the electric equipment (ch.4) ,i.e. lights, refrigerator etc.
- check that no oil or water trickles out of the machinery (ch.3)
- stop the engine and check the water separator, the fan belt, and the fresh cooling water level. If there is more water than before launching, the fresh water tubes inside the heat exchanger may have got a leak, taking in sea water into the fresh water system. If the water level is lower, there is probably a leak somewhere in the engine. Try to locate the fault and to fix

- it, but we recommend you to consult a craftsman in such cases.
- start the engine, close the hatches, turn the bilge pump on "autom", and get ready for the trial.

You probably haven't been manoeuvring the yacht for some time now (if at all), wherefore we remind you to be cautious, and to estimate the wind direction, position of neighbouring boats, possible current etc. carefully, before setting out.

GRP PARTS

The gelcoat used on NAUTICATS will not fade in the sun or by age. However, to achieve maximum durability, the hull needs maintenance.

Cleaning

Make sure that there is no sand, or other abrasive substance on the hull, by gently brushing it off with a dry cloth. Then clean with warm water and detergent, using either a sponge or a soft brush.

WARNING: All detergents containing corrosive substances such as ammonia or chlorine are strictly prohibited on GRP surfaces. After cleaning, all the detergent must be rinsed off. All wooden parts possibly splashed on with detergents should be specially rinsed and dried.

Polishing

When cleaned, the boat should be polished with car or boat wax. Liquid polish is easy to use, but does not protect as well as solid polish. Detergent/polish combinations do not give a long lasting gloss. Polish the hull twice a season, or more often.

Mending scratches

The thickness of the gelcoat is about 6mm (0,02 in). If the hull gets scratches or stains, level them out, if coarse, with wet emery paper (first 250, then 1000), and finish them off with rubbing compound, e.g. Farecla 1 or 7. If the marks are very small there is no need for the emery paper. Rub the compound with an absolutely clean cloth. Repeat 3-4 times. The area will only look half glossy, but the marks will fade away. To get a full gloss, apply 2-3 coats of wax polish.

Scratches through the entire gelcoat must be patched with gelcoat as soon as possible. A two-pound can of gelcoat in the hull colour is delivered with each NAUTICAT. Gelcoat work takes experience, and should be done by skilled craftsmen.

The delivered gelcoat takes 2% hardener, (e.g. meck peroxide)

## WOODEN PARTS

Exterior teak

The treatment depends on whether you want the teak to remain dark or become light, "grey". If a dark tinge is desired, oil the wood from time to time, using either normal teak oil, or special water resistant cleaning/brightening liquids. Before applying the oil, clean the wood with mild detergent to avoid scrubbing in dirt. Let dry thoroughly, then oil with a clean cloth or foam plastic. Apply at least 3-4 coats. Wipe off any excessive oil with another cloth. Oil the deck more lightly, or else it will tend to get slippery.

Should the fibres of the wood start standing out, you can smoothen the surface with fine abrasive paper.

Interior teak

The interior teak joinery needs very little maintenance. Cleaning with a wet cloth will usually do. If the wood seems to lose its colour a very slight oiling will restore the original tone.

Mahogany

Sunshine, scratches in the varnish, and damp storage will damage varnished mahogany. Mend scratches as soon as possible, by applying new varnish. Apply new varnish once a year. Read the instructions on the varnish cans carefully.

General

If the yacht is covered when stored, make sure that the air can pass freely under the cover. This will make all wooden parts feel better.

Keep all wooden parts clean. Wash off dirt, dust and salt as often as possible.

\* or varnish. Previously oiled surfaces should not be varnished.

## 12. LAYING UP AND WINTER STORAGE

### 12.1 HAULING OUT

The yacht can be hauled either with a cradle on tracks, or by lifting with a crane. If using a crane, observe the same cautions as when launching (drawing "docking plan and cradle"). When applying the slings, make sure they won't rest on the propeller shaft.

### 12.2 CRADLE

Preferably store your NAUTICAT in her own cradle. If not possible, try to store her resting on her keel and horizontally. Her centre of gravity is at about the engine fore end, but don't trust yourself to have found it. Remember to be extremely cautious when supporting her from the sides. A knocked over yacht of the NAUTICAT size may cause very serious damage to surrounding objects and people, and at least suffer certain hull damage herself.

### 12.3 MACHINERY

Before hauling your NAUTICAT, fill the fuel tanks brimful, in order to avoid condense water forming in them during the winter storage. The table below gives the most important service measures to be undertaken when the yacht is layed up for the winter. We refer to the corresponding chapters for more details:

- change the engine oil (ch.3.1.3, Ford manual p.20)
- change the oil filter (Ford manual p.21)
- change the fuel filter (Ford man p.31)
- check the fresh cooling water level, and make sure it contains a 50% proportion of anti-freeze.
- drain the sea water cooling system and change the zinc anodes (ch.3.1.1 and 4.7)
- protect all the electric equipment with CRC or similar substance

During the winter storage, turn the engine shaft a little with a spanner on 2-3 occasions, to avoid having the pistons resting on the same place in the cylinders, thus possibly leaving marks. Or feed some engine oil into the cylinders by the air intake. (SAE 10) This requires the presence of a competent person.

## 12.4 OTHER PARTS OF THE CRAFT

- drain the fresh water tank/tanks by running the PAR pump all taps open. When the pump sucks air, undo the hose at the pump outlet, and empty the upper part of the plumbing system by blowing strongly. Dry the water tanks and leave the caps open.
- drain the optional sea water system by running the PAR pump all taps open, and emptying the hoses by undoing them at the pump outlet and blowing strongly.
- drain the WC bowl by pumping with the lid open. The intake and outlet seacocks should both be open. When the bowl is empty, fill it with 1/2-3/4 gallon of 50% water/anti-freeze, pumping simultaneously until it is empty again, but not more.
- drain the Junkers water heater from its draining tap.
- drain and clean the bilge.
- check that the fuel gauges indicate full tanks, and, if necessary, fill the tanks brimful to avoid condense water.
- open the engine room hatches and leave them open.
- remove the batteries for separate winter storage at a service facility.
- spray exterior metal parts with CRC or WD 40 or similar.
- clean the anchor boxes and remove the gas bottle. Check that all gas taps are closed.
- clean the exterior.
- remove all textiles and pile them loosely in a dry place.
- remove all sails. Dry them and store them in a dry place.
- cover the yacht well, yet making sure that the air can pass freely under the cover, and making sure that the cover won't flap against the hull. Try to fasten the cover without having it touch the hull at all.
- a good thing for protecting the guard rails, which may be exposed to sun and wind rain at the bow and stern although the yacht has been covered, is an old fire hose split up on one side, and pulled over the rail.

## 12.5 THE RIG

Halyards

Check that shackles, wires, ropes, and particularly the rope-wire joints are OK. Replace any part which may not be strong enough.

Check the halyard sheaves in the mast head. They should rotate freely.

Corrosion between mast and steel parts

Stainless steel halyards, stays and shrouds cause corrosion when in contact with aluminium. Therefore store them not touching the mast.

Clean

Before winter storage, the masts should be washed with water and detergent. Rinse very well, since most detergents will corrode aluminium, just as salt.

When dry, wipe the mast with paraffin oil. Especially the casted foot needs a good oiling. Alternatively, the mast can be waxed with car wax.

## 12.6 THE HULL

After the hauling, clean the hull immediately.\* Dirt, weeds and molluscs come off much more easily when fresh and wet than when dry. After the wash, check the following:

- possible gelcoat damage, particularly all the way through flaws.
- rudder nuts should be tight and uncorroded.
- propeller shaft rubber bearing. If there is a clearance which lets light through between the shaft and the bearing, the rubber has to be renewed.
- echo-sounder transducer. Should be cleaned.
- sumlog impeller. Should move freely.

Zinc anode

Renew the hull zinc anode (ch.4.7)

Do not undertake gelcoat repairs until the hull is completely dry in the spring. We refer to chapter 11 for more details on hull maintenance.

Whatever you may need to renew, order the spare parts in good time. They are often available at a lower price in the autumn.

\* use a brush which won't scrape the gelcoat



**BERKINS' MARINE, INC.**

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(904) 453-2031

November 13, 1987

NAUTICAT  
Siltala Yachts  
Tierankatu  
Turku, Finland

Gentlemen:

Please advise as to availability of an Owner's Manual  
for a 1984 NAUTICAT 36 which has been purchased by one  
of our staff.

Thank you.

Sincerely,

Pat Chellberg

MEACOR  
Dexnon III  
Fluval  
Transmission