

Translation to english of Version 2 of Norwegian logbooks (1867-1890):

VEJLEDNING

til

Udførelse af meteorologiske Observationer paa Havet

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TR: Translator's remark

INSTRUCTION

for

carrying out meteorological observations at sea

The meteorological observations, which the meteorological institute wants to be carried out at sea, do not require other instruments than such, which as a rule are present on board any well equipped ship.

These instruments are:

Barometer, which may be a Mercury-, Aneroid- or Metal- barometer.
Thermometer, of which one should have 2 pieces, one for reading the air temperature, and one for reading the sea temperature.
One instrument, which is not compulsory, but of great interest, is a hydrometer, for determination of density of the sea.

The mercury barometer

Any mercury barometer, which is going to be used for making reliable observations, should be provided with a thermometer, which serves to read the temperature of the mercury of the barometer. It must hang in gimbals, in a place where it can swing freely, and not exposed to the sun's radiation or rapid changes of heat, thus not hanging near a fireplace. That it in addition must be of a strong construction, and be without air above the mercury, goes without saying. The transport of the mercury barometer must be carried out with great care. When the barometer has been removed from the gimbals, it has to be placed in a slanting position until the mercury completely has filled up the tube to the top. Then, it can be taken and carried in a horizontal position (never upright).

The aneroid barometer

The aneroid barometer should be equipped with a thermometer (which should be placed on the dial, but it may also be placed

besides), because it changes its stand according to the heat of the environment. It must be placed fixed to the wall on a place where it is not exposed to strong changes in heat. It may also be placed horizontally. It must not lurch, and the place and position it has got must not be changed. The rules applied to the aneroid barometers, also apply to the metal barometers.

Observing the barometer

The following remarks apply to all kinds of barometers. At first one reads and notes the temperature of the thermometer attached to the barometer. The thermometer should be read with an accuracy of half a degree Centigrade or Reaumur, and at nearest whole degree Fahrenheit.

Thereafter one taps with the finger on the barometer, so that one observes that the mercury is trembling or the needle vibrates. At the Aneroid-barometers it is in this way possible to see, whether the barometer is rising or falling, because by disturbing, the Needle will settle on a higher or lower scale numeral than before.

Finally, one reads the height of the barometer, on mercury barometers by means of the vernier, and on Aneroid- or Metal-barometers by visual estimate. The exactness required for obtaining usable observations, is as follows:

Minimum of exactness required	desireable Exactness
one millimeter	a tenth of a millimeter
a half french line	a tenth of a french line
a half tenth of an english inch	a hundredth part of an english inch

Mercury barometers give as a rule tenths of a millimeter or a hundredth of an english inch by use of the vernier. The Aneroid barometers are scaled in whole millimeters or tenths of english inches. It is easy by eye estimate to judge how many tenths it is between two scale lines, and thereby note the reading with the desired accuracy.

What kind of barometers ought to be used?

The mercury barometers constructed for use at sea, are slow in their motion. They show too high when the pressure is falling, and too low when the pressure is rising. They are at their lowest point shortly after the air pressure was lowest, and they are at highest level a little while after the air pressure was highest. They also require much space. Their advantage is, that they can be read with great marginal definition, and that they during lapse of time keep unchanged, but show the same height by same air pressure.

The Aneroid- and Metal barometers react faster than the Mercury barometers; they follow the changes of air pressure

very fast, and are thereby capable of indicating to thereby indicating rapid changes in weather. They take up just small space, and they are easily read. Their weak point is, that by

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lapse of time, they change, so that they at any given time will not necessarily show the same scale value by same air pressure. For practical use on board, the Aneroid barometer is absolutely the most convenient compared with the mercury barometer. For scientific observations, they should also be preferred, if they are systematically read during stay in port, where reliable observations carried out with a local station barometer can be obtained for comparison (see below), and the voyages are not too long-lasting. Ships on voyages of long duration, should have an Aneroid barometer for daily use and a mercury barometer, which should be read simultaneously from time to time, particularly when the barometer is quiet. In this way, the Aneroid barometer can continuously be controlled.

The most proper scale unit for a barometer is the millimeter. Up to this time, the most common unit has been english inches, but this scale is not so convenient, because to obtain the same precision as for millimeters, one has to use tenths or hundreths. French inches and lines are not in common use at sea barometers.

The meteorological diaries, kept at sea and sent to the meteorological institute (TR: The Norwegian Meteorological Institute in Oslo), are sent to the Paris Observatory for scientific use in a completely worked up form. The barometer readings are then expressed in millimeters. It is therefore of great help for the institute, when the barometers have got their scales in millimeters.

How are the errors of the barometer determined?

A barometer which is quite correct, hardly exists. If the barometer readings shall be useful, one must know the error of the barometer. The error may be determined in several ways, but all of them are based upon comparison with a reliable barometer on a land station.

Barometers could be sent for examination in Christiania (TR: Oslo) to the meteorological institute, or to Bergen, to the observatory. At the telegraph stations in Sandøsund, Mandal, Skudenes, Florø, Aalesund, Christiansund, Brønøsund, Bodø, at Reine lighthouse in Lofoten, at the college of education in Tromsø, at Fuglenes lighthouse near Hammerfest and at Vardøhus, the ship's barometer could be examined by direct comparison with reliable barometers.

The exact examination of a barometer will, at the meteorological institute take at least a couple of days, at the other places a week or more. By means of the comparisons mentioned, it is possible to see if the barometer is fit for use or not. In connection with transport of the barometer back to

the ship, or by setting up the instrument on board, the error of the instrument may change. If so, the error has to be determined up again, by observations made on board compared with corresponding observations ashore. A ship's barometer should therefore, if it is going to be examined ashore, be

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brought to the meteorological station concerned for a longer time, preferable more than 14 days, before the ship departs, and it should be brought back on board 8 days before departure. It is not necessary to examine a barometer on shore, because if the following rules are followed, and if the barometer otherwise is good, their corrections could be determined with sufficient precision.

In foreign ports, the ship's barometer ought not to be taken ashore, but remain at its position on board, if it does not need to be repaired.

After having started the barometer readings, no removal of the barometer, which might change its correction value, must take place. In case of an accident with an instrument, it should be noted carefully in the Remark column.

During the days which pass, from the time when the barometer has got its fixed position on board, and until the ship leaves (which not ought to be more than 8 days), the barometer should be read (after the rules given above), as often as possible:

In Norwegian ports at 8 am., 2 pm. and 8 pm., and in foreign ports at 8 am. The same routine should be carried out in any port, in which the ship stays for some time, and in additionally when passing through straits and sounds or along coasts. The meteorological institute has currently got information about the correct barometer height along all the coasts of Europe by 8 am. and at the coast of Norway by 8am., and 2 and 8 pm., and thereby the correction of any ship's barometer and its changes can be determined, if the above rules are followed. In ports of foreign continents, the observations from ships are of particular interest for meteorology, and should therefore not be neglected. After arrival home, the readings of the barometer should continue for some days - the more frequent, the better - in a similar way as before departure.

The shipmasters are urgently requested to follow these rules, because it depends on their effort, if their observations can be used for scientific purposes.

Thermometer

Any ship ought to be equipped with two thermometers, which should be well mounted, to prevent it breaking into pieces. As thermometers are vulnerable instruments, and because observations always are carried out outside, a well equipped ship always ought to keep one or more thermometers in reserve. Thermometers with Celsius scale are recommended in preference to Reaumurs or Fahrenheits, because the logbooks which are prepared for sending to the Paris Observatory, always will express the temperatures in Celsius degrees.

By observing the temperature, the eye must always be kept right in front of the point of the scale, where the mercury string shows the temperature. The least degree of accuracy, which is required, is the nearest half degree or quarter of one degree Celsius or Reaumur, and the nearest whole degree Fahrenheit. Preferably, an accuracy of 1/10 degree Celsius or Reaumur and 1/4 degree Fahrenheit. As thermometers generally are divided into whole degrees, one must observe the tenths

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and quarters of one degree by visual estimate. Temperatures above zero are written without + before the value. On the other hand, - (minus) is put before all temperatures below zero. The bulbs of the thermometers must always be kept clean for dirt, rust or other coating.

How do we find the error of the thermometer?

Nearly all thermometers are more or less erroneous. Thermometers used on ships can be examined at the meteorological institute in Christiania (TR: Oslo), and at the observatory in Bergen. The examination is carried out by comparison with the thermometers of those stations. For those shipmasters, who have not got the opportunity to send their thermometers to the stations mentioned, another way of approach can be recommended: One takes snow, and pours over with water, so that a thick gruel is formed. A thermometer is placed in it, with the bulb well surrounded by the snowy gruel. After a quarter of an hour, one will see that the mercury string of the thermometer, will stand unchanged at a certain point. A Celsius- or Reaumur-thermometer would then show 0 degree, and a Fahrenheit thermometer would show 32 degrees. The deviation, which the thermometer shows above or below the zero point, is defined as the error of the thermometer. It is noted in the log book: The thermometer showed n.n. degrees (+ or -) in melting snow. In stead of snowy gruel, one can use fine corned ice, well packed around the bulb. Tests like these, have to be carried out in a room where the temperature is above zero, so that the snow or ice is melting. Observations which have been done with thermometers with unknown error, are useless for scientific use. The instrument maker's note about the accuracy of the thermometer is of no importance, if not accompanied with a certificate from a scientific institution. The error of a thermometer can not be determined (as for barometers) by comparing the readings on bord with readings of a correct thermometer on land. If a thermometer is to be distinguished from any other thermometer, it has to be equipped with the name of the instrument maker and with list number.

Note: It is not needed to examine the thermometer which is attached to the barometer.

Observation of the air temperature

The thermometer has to be placed in a place where it shows the real temperature of the air. It therefore has to

- hang in free air,
- not in a casing or in a cabin,
- in shadow - not in the sun,
- and not to be exposed to become wet from rain, snow, or sea water,
- not in places where warm air from heated places can reach the thermometer.

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Observation of the temperature of the sea

For such observations, a special thermometer is used*). One takes a bucket of water as far from the ship's side as possible, on steamships ahead of the engine. The bucket should be in the water for a while, for achieving the temperature of the water. It is placed on the deck in shadow, the water thermometer is placed into it and is read after a few minutes. During the reading of the temperature, the bulb and lower part of the thermometer must remain in the water.

*) In France, they use water thermometers, on which the bulb is surrounded by a thick tuft of hemp. The thermometer is thrown over board and dragged after the ship. The tuft becomes filled with water, and the water is kept so long time, that the thermometer several minutes after it has been hauled on board will show the sea surface temperature exactly.

The hydrometer

serves to determine the density of the sea water. It is observed at the same time as the temperature of the sea water in the same bucket. The scale numbers on the string runs from 0 to 40. 0 means fresh water. 40 means that 1000 cubic feet of sea water has got the same weight as 1040 cubic feet of fresh water. To a useful observation with the hydrometer belongs also observation of the temperature of the water. The hydrometer is not a compulsory instrument. They are very frail. They are nearly never correct, however, they could be examined at the meteorological institute.

Structure of the logbook

On the title page, the tackling of the ship, its name, home port, calling signal according to the universal signal system, and the name of the shipmaster shall be entered. In addition time of departure and arrival to different harbours, and duration of the voyage in days.

On the back side of the title page, the questions concerning the instruments are to be answered.

On top of each page of the logbook, the waters, which have been

passed during the days found on that page, port of departure, port of destination, and the magnetic deviation as observed or determined from the map.

1. Column. Here is kept Year, Month, and Date. The date is written before every day's noon time. (MD in second column).**)

**) Note: By circumnavigation it must be expressly stated which date is counted two times when sailing eastwards and which date is left out, when sailing towards west.

2. Column. The time for each changing of the watch. If observations are not carried out by each changing of the watch, observations at 8 o'clock a.m. and 8 o'clock p.m. should be preferred. These hours has been printed in somewhat greater size. MD means midday and MN means midnight.

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3. Column. Place of being. This should preferably be given for 8 o'clock a.m. and (if possible) at 8 o'clock p.m. It is sufficient, if the position is given only for midday. When latitude and longitude is determined by observation, this is to be noted by adding "Obs". Near coast it is wanted that the position is given by latitude an longitude, in stead of by bearings. By staying in port, the name of the port shall be given.

4. Column. Barometer. In the column "Therm" shall be noted the reading of that thermometer which is attached to the barometer. In the column "Højde" (TR: Height) shall be noted down the barometer reading. See above under "Observing the barometer". The barometer readings, which are carried out in port, are noted in the same way in these columns.

Note: Tenths of a millimeter of a french line, hundreths of an english inch, tenths of degrees are written as decimals, f. i. Barometer = 762mm.4 or 30.02 engl. inches. 14gr.8 Celsius = 11gr.8 Reaumur.

5. Column. Temperature of air or water. Above each of these columns, shall be noted the serial number of the thermometer in use. All temperature readings below zero shall be written with the sign - (minus) before the figure.

6. Column. Wind. The direction of the wind shall be noted according to the Compass. Generally, the 16 points N, NNO, NO, ONO, O, OSO, SO, SSO, S, SSV, SV, VSV, V, VNV, NNV, will be sufficient (TR: O stands for ost, which means east. V stands for west). When the magnetic deviation is near 1 or 3 points, it is desireable that the wind direction is given by the nearest point of the compass.

By close-hauled sailing, the wind on board is felt to arrive more from ahead than it is blowing at the sea. On sailing ships, the deviation does not exceed 2 points, so it can be put out of consideration. On steamships, the deviation can be extremely big, even up to 16 points, when the ship moves faster than the wind. On steamships, the direction of the wind must not be estimated from the drift of smoke, but according to what can be

seen on the sea.

The force of the wind, shall be given by numbers according to the following scale (the scale numerals are half the Beaufort scale for the wind force):

- 0 = Stille.
- 1 = Svag, eller løj.
- 2 = Laber. Frisk bris. Bovenbramsejl til bramsejl
- 3 = Frisk kuling. Bramsejl til enkeltrebet Merssejl
- 4 = Sterk. Enkeltrebet Merssejl til klosrebet Merssejl Klos
- 5 = Storm. Klosrevet Merssejl til Stormstagesejl. Bidevind
- 6 = Orkan. Intet Sejl kan føres.

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(TR: The following sailing terminology and naming of the sails have been identified in our dictionary:

Bovenbramsejl = Royal
Bramsejl = Topgallant sail
Enkeltrebet Merssejl = Single reefed topsail
Klosrevet = close reefed
Stormstagesejl = Storm staysail
Intet seil kan føres = No sail can be carried
Bidevind = close hauled or by the wind)

When the wind is gusty, the force of the gust shall be entered behind the figure denoting the mean wind force, for example 4-5 Strong with Storm in Gusts.

7. Column. Cloud cover. One imagines the clouds gathered into one total mass, and notes how many tenths of the sky they will cover. Thus, 0 means clear sky, 2 or 3 means light clouds, 5 half clear, 7-8 cloudy and 10 totally overcast.

8. Column. Here is going to be entered different kinds of precipitation with letters in the following way (TR: english in brackets inserted by translator):

R = Regn (Rain), S = Sne (Snow), Sl = Slud (mixed snow/rain), T = Taage (Fog), H = Hagl (Hail).

Heavy rain, Snow etc. shall be written as RR, SS etc.

Light rain, snow etc. -- r , s etc.

Rain showers, snow showers, hail showers = Rbg., Sbg., Hbg.

9. Column. Sea state. Is noted with figures according to the following scheme:

- 0 = Havblik 0.0 meter
- 1 = meget smult 0.0 - 0.1

2 = smult	0.1 - 0.5
3 = svag Dynning	0.5 - 1.3
4 = Nogen Sø	1.3 - 2.5
5 = Megen Dynning	2.5 - 4.0
6 = Høj Dynning	4.0 - 6.0
7 = Hul Sø	6.0 - 9.0
8 = Svært Hav	9.0 -14.0
9 = Svært oprørt Hav	>14.0

(TR: The scale used for sea state runs from 0 to 9, as for the scale in current use today. The naming of the wave types has, however, been changed. The corresponding wave heights given above to the right and inserted by the translator, are based upon modern observations at the lighthouse Ferder in outer Oslofjorden).

10. Column. Remarks. Here is space for notes on Hydrometer, colour of the sea, currents, ice, drifting of the high light clouds (direction as for wind), waterspouts, ring around sun or moon, thunder storm, northern light etc. At the back of the book, several more blank sheets can be found for more extended remarks.

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All readings of the instruments shall be noted without corrections for instrumental errors.

Meteorological observations are wanted from all oceans, both from remote and nearby waters.

Please return completed schemes to the meteorological institute, Christiania (TR: Oslo) by post, marked with "free postage", from Norwegian or Swedish (not foreign) port, or through an enlistment office.

New Journals can be obtained at any enlistment office, in Christiania (TR: Oslo) at the meteorological institute, in Bergen at the observatory and by pilot master, Mr.H. Lous. Received journals, which has not been used, are kindly asked to be returned.

The meteorological institute will provide obtaining and examination of instruments for the ship masters who wish and are willing to carry out meteorological observations at sea, if they address about it at the institute.

A good barometer costs	from 8 to 12 Spd *)
A thermometer -	- 2 to 5 Ort *)
A hydrometer -	- 3 Ort

(* TR: Out of date units of coinage)

Examination of the instruments is carried out without cost for the ship masters who return observations to the meteorological institute.