NORTH ATLANTIC TREATY ORGANIZATION
ORGANISATION DU TRAITE DE L'ATLANTIQUE NORD

MILITARY AGENCY FOR STANDARDIZATION (MAS)
BUREAU MILITAIRE DE STANDARDISATION (BMS)

1110 BRUSSELS
TEL : 241.00.40 - 241.44.00 - 241.44.90

MAS/93-NAV/4194
6 April 1983

To : See distribution below

Subject : STANAG 4194 NAV (EDITION 1) - STANDARDIZED WAVE AND WIND ENVIRONMENTS AND SHIPBOARD REPORTING OF SEA CONDITIONS

Reference : AC/141(IEG/6)D/86 dated 15 May 1981

Enclosure : STANAG 4194(Edition 1)

1. The enclosed NATO Standardization Agreement which has been ratified by nations as reflected in page iii is promulgated herewith.

2. The reference listed above is to be destroyed in accordance with local document destruction procedures.

3. AAP-4 should be amended to reflect the latest status of the STANAG.

ACTION BY NATIONAL STAFFS

4. National staffs are requested to examine page iii of the STANAG and, if they have not already done so, to advise the Defence Support Division of the International Staff, through their national delegation as appropriate of their intention regarding its ratification and implementation.

J.J.A. DOUCET
Major-General, CAAR
Chairman, MAS

DISTRIBUTION

Action: All members of the Naval Board, MAS

Information: SECGENNATO (DS Div); SACEUR; SACLANT; CINCHAN; CINCNORTH COMBALTAP; COMNAVBALTAP; CINCENT; CINCSOUTH; COMNAVSOUTH COMSTRIKFORSOUTH; CINCUKAIR; CINCWESTLANT; CINCEASTLANT CINCIBERLANT; COMSTRIKFLTLANT; COMSUBACLANT

STANAG No. 4194
(Edition 1)

NORTH ATLANTIC TREATY ORGANIZATION
(NATO)

MILITARY AGENCY FOR STANDARDIZATION
(MAS)

STANDARDIZATION AGREEMENT

SUBJECT: STANDARDIZED WAVE AND WIND ENVIRONMENTS AND SHIPBOARD REPORTING OF SEA CONDITIONS

Promulgated on 6 April 1983

J.J.A. DOUCET
Major-General, CAAR
Chairman, MAS

STANAG 4194
(Edition 1)
NAVY

RECORD OF AMENDMENTS

No.	Reference/date of amendment	Date entered	Signature
1-5		23.6.05	

EXPLANATORY NOTES

AGREEMENT

1. This NATO Standardization Agreement (STANAG) is promulgated by the Chairman MAS under the authority vested in him by the NATO Military Committee.

2. No departure may be made from the agreement without consultation with the tasking authority. Nations may propose changes at any time to the tasking authority where they will be processed in the same manner as the original agreement.

3. Ratifying nations have agreed that national orders, manuals and instructions implementing this STANAG will include a reference to the STANAG number for purposes of identification.

DEFINITIONS

4. Ratification is "The declaration by which a nation formally accepts the content of this Standardization Agreement".

5. Implementation is "The fulfilment by a nation of its obligations under this Standardization Agreement".

6. Reservation is "The stated qualification by a nation which describes that part of this Standardization Agreement which it cannot implement or can implement only with limitations".

RATIFICATION, IMPLEMENTATION AND RESERVATIONS

7. Page iii gives the details of ratification and implementation of this agreement. If no details are shown it signifies that the nation has not yet notified the tasking authority of its intentions. Page iv (and subsequent) gives details of reservations and proprietary rights that have been stated.

STANAG 4194
(Edition 1)
NAVY

NATO STANDARDIZATION AGREEMENT

(STANAG)

STANDARDIZED WAVE AND WIND ENVIRONMENTS AND SHIPBOARD REPORTING OF SEA CONDITIONS

Annexes:
- A. Ocean Operational Areas Covered by the Source Document
- B. Summary and Application of Source Document Material for Ship Seakeeping Performance Assessment
- C. Recommended Standard for Shipboard Reporting of Wave and Wind Conditions
- D. NATO Sea State Numeral Table for the Open Ocean North Atlantic
- E. Definitions
- F. References

Related Documents:
1. General Criteria and Common Procedures for Frigate/ Destroyer Seakeeping Performance Assessment, NATO STANAG 4154
2. Standardized Wave and Wind Environments for NATO Operational Areas, Report SPD-0919-01 of the David W. Taylor Naval Ship Research and Development Center, Bethesda, MD 20084, USA (ANEP 11).

AIMS

1. The aims of this agreement are to:
   a. Establish the use of a common source of wave and wind data for NATO Operational Areas and their application for the purposes of assessing the operability, interoperability, and habitability characteristics of participating nation ships and ship designs.
   b. Provide a recommended standard for observations of sea conditions by participating nations, to be followed during ship trials or operational evaluations wherein the recording of seakeeping data is of primary importance.
   c. Provide a NATO Sea State Numeral Table to categorize sea conditions for the open ocean North Atlantic for reference purposes by participating nations.

AGREEMENT

2. Participating nations agree to adopt the aims of this STANAG for the purposes of seakeeping performance assessment to establish operability, interoperability, and habitability for NATO operations and missions, the numeric specification

of wave and wind conditions, and the reporting of sea condition observations for NATO purposes.

3. No proprietary rights would normally be involved.

GENERAL

4. A comprehensive source of wave and wind data for NATO operational areas is required for assessing the seakeeping performance of existing ships and new designs. Furthermore, in order for participating nations to compare the seakeeping performance of different ships, and hence assess interoperability, it is necessary to use a common source of wave and wind data identically implemented into the prediction process.

5. Full scale seakeeping trials and operational evaluations of the effect of seakeeping on ship operations provide valuable data to ship designers. In conjunction with such trials or evaluations, a standard procedure should be used for the recording of sea environment conditions.

6. It is recognized that the use of Sea State Numeral Tables is a widespread practice used by operators to describe wave and wind conditions and as a general descriptor of sea environment in specifications, various reports, and documents. However, the use of such numerals is not sufficient in specifications and ship seakeeping performance assessment and they should not be used for these purposes. It is also recognized that many different tables are in use by naval, government, and maritime organizations throughout the world which can lead to misunderstanding and poor communication, see Reference 1. To the degree that it is necessary to use numerals to identify Sea States, it is required that reference be made to the same Sea State Numeral Table. Such a table will only be defined for the open ocean North Atlantic conditions.

7. This STANAG addresses the needs identified in paragraphs 4, 5, and 6. All technical material concerned with 4 is documented in Related Document 2 and Reference 2, which are together henceforth referred to as the Source Document. Annex A defines the ocean and sea operational areas for which data are presented in the Source Document and which includes the NATO operational areas. Annex B presents a summary of the Source Document contents, and guidelines for its application to ship seakeeping performance assessment, that is, to the evaluation of ship motion and motion related characteristics and recognition of hull and subsystem limiting criteria (performance degradation).

Annex C defines a recommended standard for shipboard reporting of Sea State conditions. Annex D provides a NATO Sea State Numeral Table for the open ocean North Atlantic with a discussion of the limitations associated with the use of such numeric tables. Definitions are given in Annex E and References are given in Annex F.

IMPLEMENTATION OF THE AGREEMENT

8. This STANAG is considered to be implemented when a nation has issued the necessary orders/instructions to the forces concerned, putting the procedures of the agreement into effect.

ANNEX A to
STANAG 4194

OCEAN OPERATIONAL AREAS COVERED BY THE SOURCE DOCUMENT

1. This Annex identifies ocean and sea operational areas covered by the Source Document. These areas encompass, but do not precisely define, NATO zones of operation.
2. The Open Ocean North Atlantic is identified in Figure A-1 and spans from the latitudes of the Northeast Trade Winds (up to about 30°N), through those of the prevailing Westerlies (30-60°N) and into the Polar Northeasterlies (above 60°N). Because of previous wide usage of the wave statistics provided by Hogben and Lumb, see Reference 3, their subdivision of zonal areas is adapted where possible. Areas 1, 2, 3, 6, 7, 8, 9, 10 and 11 are taken as defined by Hogben and Lumb. Areas 15, 16, 17 and 18 are identified similarly but truncated at the Tropic of Cancer (23°N). Areas 00 and 0 are new areas which have been added to span the more northerly regions.
3. The Mediterranean Sea is identified in Figure A-2 and subdivided into Areas 29, 30, and 31.
4. The North Sea is identified in Figure A-1 as Area 4 following the practice of Hogben and Lumb. The area is represented by a single location (darkened circle) near the center of the basin.
5. The Baltic Sea (including the Gulf of Bothnia) is identified in Figure A-3 and is subdivided into Areas 32, 34, 36, and 38.
6. The Black Sea is identified in Figure A-4 and represented by an Area 40 in the western more severe portion of the basin.

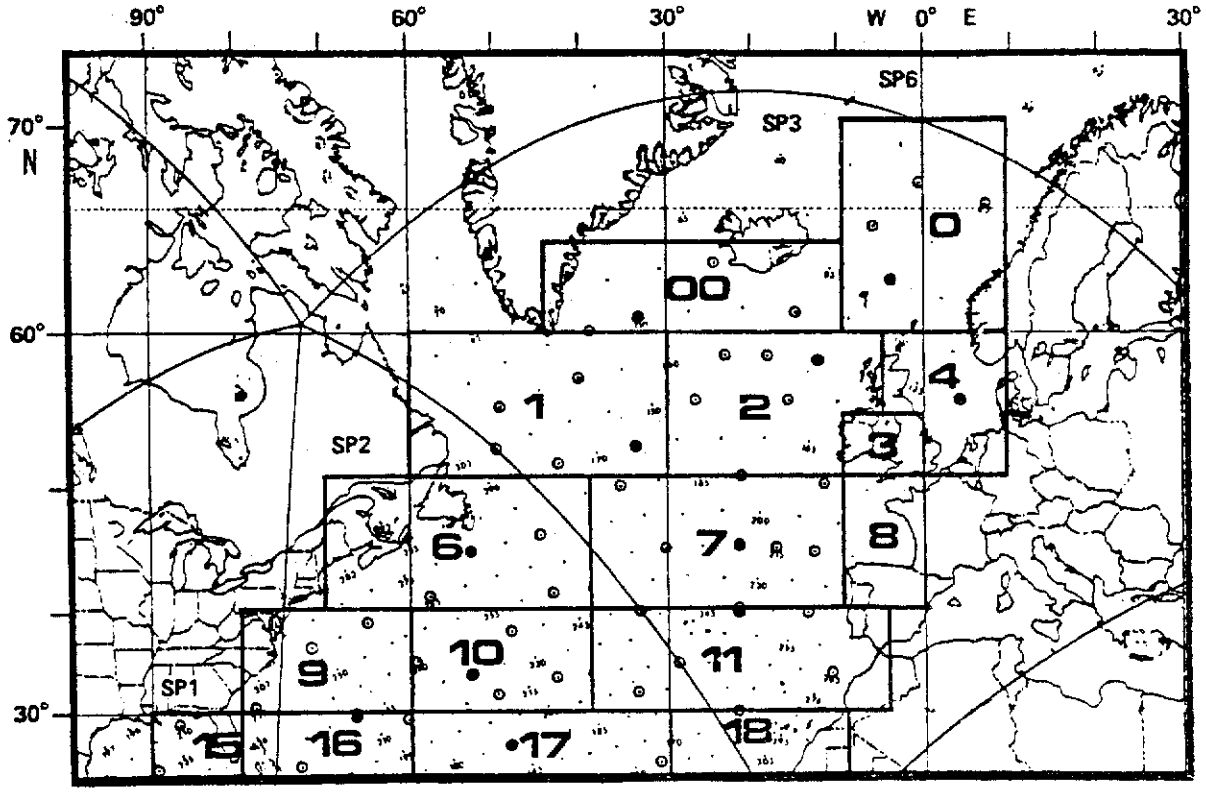

FIGURE A-1 – DEFINITION OF REPRESENTATIVE AREAS IN THE NORTH ATLANTIC BASIN

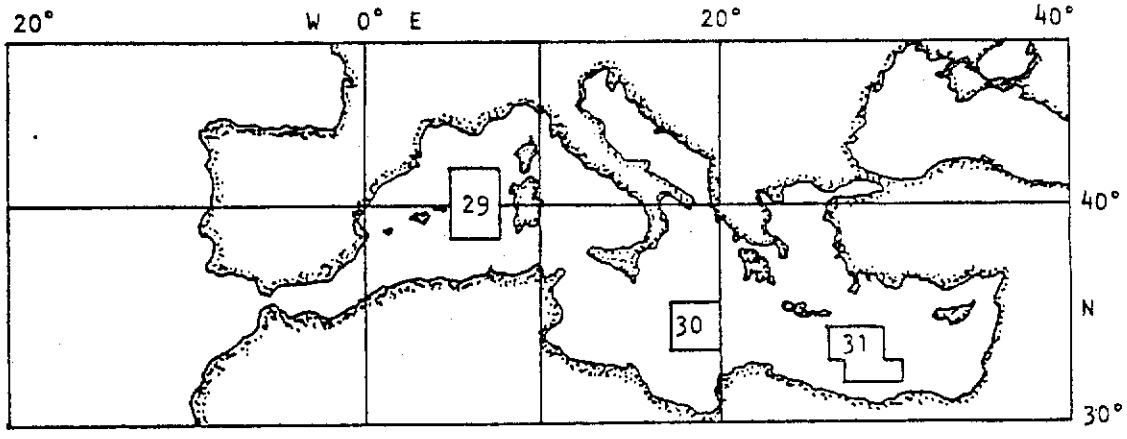

FIGURE A-2 – DEFINITION OF REPRESENTATIVE AREAS IN THE MEDITERRANEAN SEA

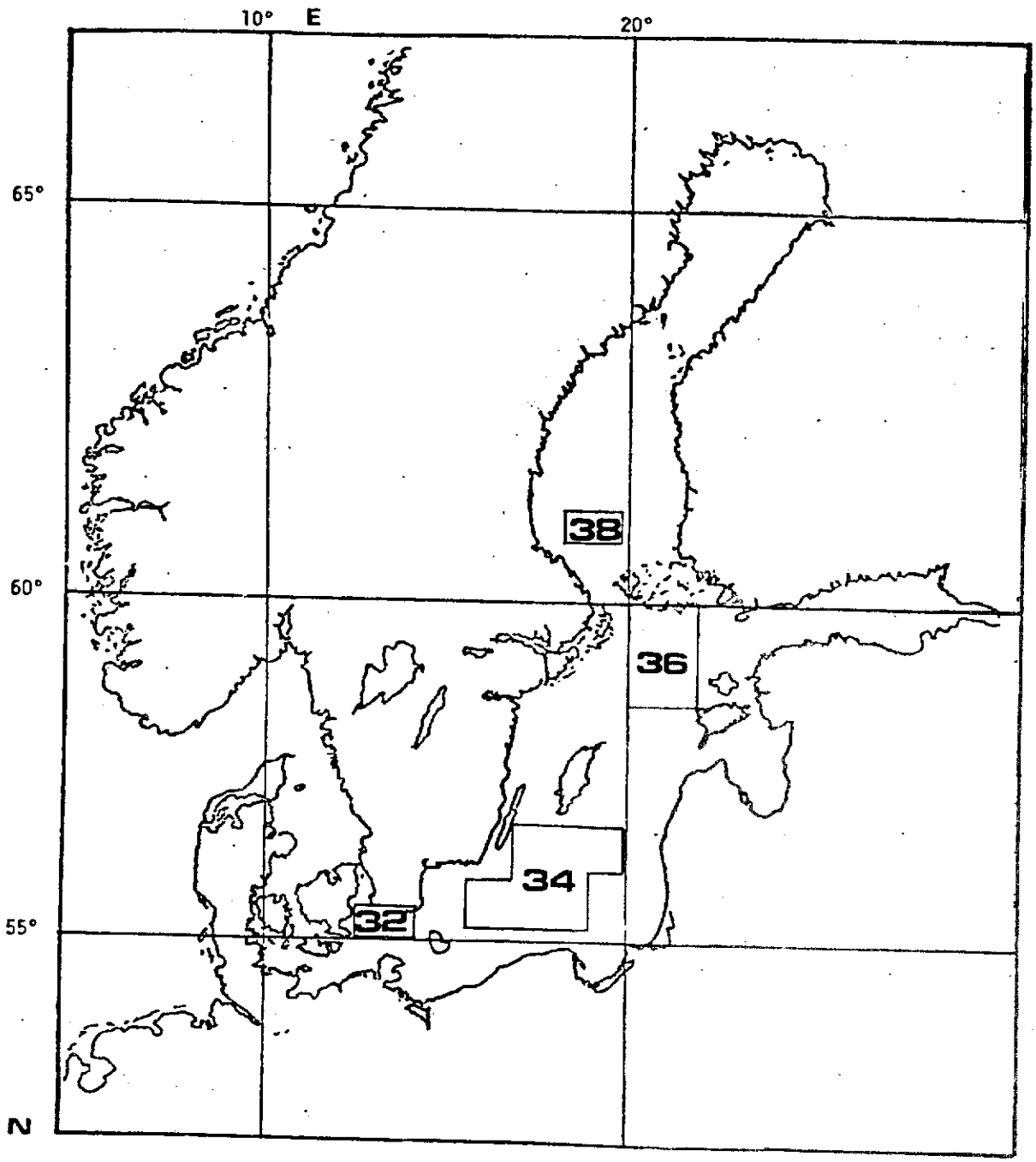

FIGURE A-3 – DEFINITION OF REPRESENTATIVE AREAS IN THE BALTIC SEA (INCLUDING GULF OF BOTHNIA)

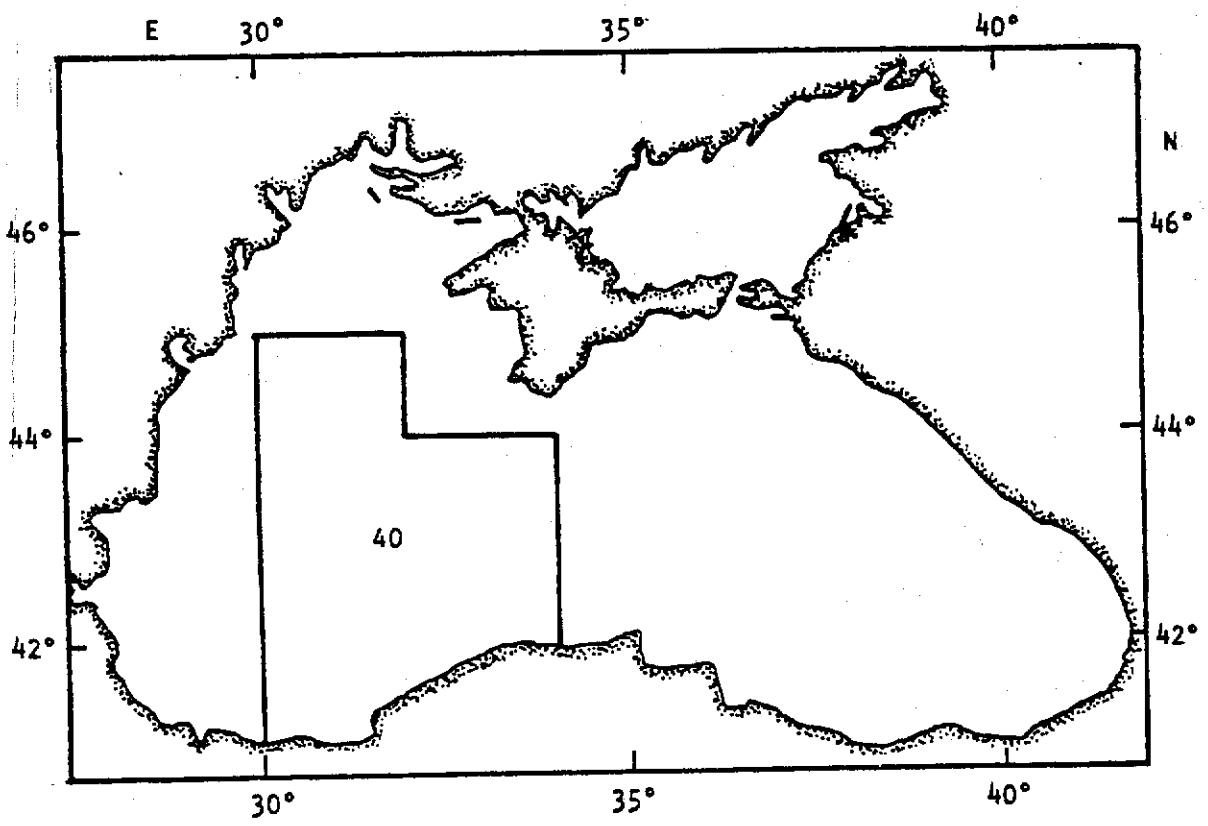

FIGURE A-4 – DEFINITION OF REPRESENTATIVE AREA IN THE BLACK SEA

ANNEX B to
STANAG 4194

SUMMARY AND APPLICATION OF SOURCE DOCUMENT MATERIAL FOR SHIP SEAKEEPING PERFORMANCE

1. The Source Document is of loose-leaf form to permit convenient updating of the text when necessary and of the sea environment statistical data as and when this becomes available. In addition to the main text it includes the following appendices:

   A - Seasonal Climatology of the North Atlantic Ocean
   B - Seasonal Climatology of the Mediterranean Sea
   C - Seasonal Climatology of the North Sea
   D - Seasonal Climatology of the Baltic Sea
   E - Seasonal Climatology of the Black Sea
   F - Data Format Description
   G - Relative Wind Envelopes for VTOL Aircraft Operations

2. For the North Atlantic Ocean and North Sea, use has been made of a new 20 year data base called the Hindcast Climatology which will increasingly become a primary source of sea environmental data for ship seakeeping analyses. It has been under continuing development by the U.S. Navy since 1976, see Reference 4, and is based on the Spectral Ocean Wave Model (SOWM), documented in Reference 5, applied to the hindcasting of wave conditions throughout the Northern Hemisphere.

3. The darkened circles in Figure A-1 indicate SOWM grid points included in the North Atlantic Ocean and North Sea statistics given in the Source Document. Ultimately the locations indicated by open circle grid points will be included in these statistics. Statistical data are presented for the following parameter sets:

   a - Significant wave height versus modal wave period
   b - Significant wave height versus wind speed
   c - Significant wave height versus primary wave direction
   d - Wind speed versus wind direction
   e - Significant wave height versus wind speed (using NATO Sea State definition)
   f - Persistence of significant wave height
   g - Persistence of wind speed

for annual, winter, spring, summer, and autumn time spans. The data is based on a ten year period from September 1959 to August 1969.

4. The Hindcast Climatology will eventually be extended to include the Mediterranean Sea. However, at the present, wave and wind statistics for the Mediterranean are provided for annual and seasonal time spans using Reference 6 for the Areas 29, 30, 31 shown in Figure A-2. Statistical data are presented similar to that identified in 3a, 3b, 3c and 3d.

5. Wave and wind statistics are presented for:

   a. The Baltic Sea including the Gulf of Bothnia, and derived from References 6, 7, 8 and 9 for the four Areas 32, 34, 36 and 38 shown in Figure A-3.

   b. The Black Sea data are derived from Reference 10 for Area 40 shown in Figure A-4. An eastern area is not included since the prevailing conditions are less severe than for the more westerly Area 40.

   The presented data are similar to that given for the Mediterranean Sea.

6. For the seakeeping performance assessment of ships in the design stage, operational areas specified in the requirements will not normally coincide with one of the single areas given in the Source Document.

7. Statistical data for the North Atlantic Ocean, Mediterranean Sea, North Sea, Baltic Sea, and Black Sea should be treated separately. Within these regions representative conditions are obtained as the average of the conditions for the specific areas involved.

8. If operational areas are not specified, ship seakeeping performance assessment should be based on the annual average wave and wind statistics of the North Atlantic Ocean provided as Figures A-2 to A-8 of Appendix A in the Source Document.

9. Reference Conditions: Table B-1 provides a set of Reference Conditions for seakeeping performance comparisons. Modal wave period ranges are defined by minimum (5 percentile) and maximum (95 percentile) values associated with each wave height.

10. Wind direction and predominant wave direction are assumed identical.

11. As stated in the Source Document, all sea conditions must be interpreted as irregular by application of spectra. The Bretschneider two-parameter spectral formulation, as currently prescribed by the International Ship Structures Congress (ISSC) and International Towing Tank Conference (ITTC), see References 11 and 12, is recommended for open ocean conditions of the North

Atlantic Ocean and the Mediterranean Sea for purposes of ship design and performance assessment. It is given by formula (1) of the Source Document. Other spectra may be used in addition, if the necessity occurs, but these spectra must be clearly identified with the results.

For the North Sea, the Baltic Sea and the Black Sea, the modified JONSWAP spectrum is recommended as more suitable. It is given by formula (5) of the Source Document.

In order to represent short-crested seas, the directional spreading function, as given by formula (2) of the Source Document, should be used.

12. Normally all relative headings of the ship to the predominant wave direction are considered to be equally likely. For certain purposes, worst relative heading is also used for design and performance assessment.

TABLE B-1 – WAVE STATISTICS (REFERENCE CONDITIONS) FOR SHIP PERFORMANCE ASSESSMENT

OPEN OCEAN NORTH ATLANTIC (ANNUAL)		
Significant Wave Height (m)	Modal Wave Period (sec)	
	Range*	Most Probable**
1.5	5.6 – 14.9	7.5
2.5	7.2 – 15.3	9.7
3.5	8.8 – 15.8	9.7
4.5	9.6 – 16.0	12.4
5.5	10.6 – 16.1	12.4
6.5	11.2 – 16.6	12.4
7.5	12.0 – 17.0	13.8 – 15.0

*Minimum is 5 percentile and maximum is 95 percentile for periods, given wave heights.
**Based on periods associated with central frequencies included in Hindcast Climatology.

ANNEX C to
STANAG 4194

RECOMMENDED STANDARD FOR SHIPBOARD REPORTING OF WAVE AND WIND CONDITIONS

1. A number of weather observation sheets are in use by mariners throughout the world.
2. Table C-1 is recommended for shipboard reporting of wave and wind conditions by NATO navies, to be followed during ship trials and operational evaluations wherein the recording of seakeeping data is of primary importance. The table is consistent with World Meteorological Organization (WMO) reporting techniques. Recommendations regarding the completion of Table C-1 are derived from References 13, 14, and 15 and follow:
    a. A continuous record of wave and wind observations while at sea is required and should therefore be taken at one hour intervals as daylight permits. These observations provide valuable information regarding the ship's performance and can be used for correlation with analytic investigations of ship performance.
    b. Report latitude in column 2 in degrees and tenths, the tenths being obtained by dividing the number of minutes by 60 and neglecting the remainder.
    c. Report quarter of the globe in column 3 by selecting the appropriate code figure from Table C-2 for the quarter of the globe corresponding to the latitude and longitude of the ship at the time the observation is taken.
    d. Report longitude in column 4 in degrees and tenths. The tenths of longitude are obtained in the same manner as for latitude.
    e. Report the ship course in column 5 using the appropriate code from Table C-3.
    f. Report the nominal ship speed in column 6 and the log speed in column 7 in knots.
    g. Report the true wind direction in column 8 using the appropriate code from Table C-3.
    h. Report the method by which the wind speed is estimated in column 9 using the appropriate indicator code from Table C-4.

i. Report the true wind speed in column 10 using two digits (for example, a 9 knot wind is reported as 09). Speeds above 99 knots and unusual gustiness should be noted in column 24.

j. Report the elevation of wind speed observation above the sea surface in column 11 by the appropriate code from Table C-5.

k. Report the wind wave direction in column 12 using the appropriate code from Table C-3.

l. Report the wave height in column 13 using the appropriate code from Table C-6. Observed wave height is correlated to significant wave height by the Nordenström relationship given in the Source Document.

m. Report the wave period in column 14 using two digits (for example, a 9 second wave is reported as 09). Nordenström has reported that the observed wave period is generally correlated with the modal wave period.

n. Report the wavelength in column 15 using three digits, and rounding to the nearest five meters (for example, a 76 m wave is reported as 075).

o. Report the values associated with up to two swell trains in columns 16 to 23 in a similar manner as for wind waves.

p. Report any unusual synoptic conditions or ship performance degradation in column 24.

q. In applying Tables C-2 to C-6, the boundary value is always assigned to the lower code.

Additional details regarding marine observations can be found in References 13, 14, and 15, at least one of which is usually available on NATO ships.

TABLE C-1 - RECOMMENDED NATO FORMAT FOR WAVE AND WIND OBSERVATIONS

NATO SHIP WAVE AND WIND OBSERVATIONS

VESSEL_____ SHIP TYPE_____ HULL NUMBER_____ CRUISE_____

DAY_____ MONTH_____ YEAR_____

Time (GMT)	Ship Position			Ship Course	Nominal Ship Speed	Log Ship Speed	Wind				Wind Waves (Sea)				Swell				Swell				Remarks
	Lat	Q	Long				Dir	Indic	Speed	Elev	Dir	Ht	Per	Length	Dir	Ht	Per	Length	Dir	Ht	Per	Length	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
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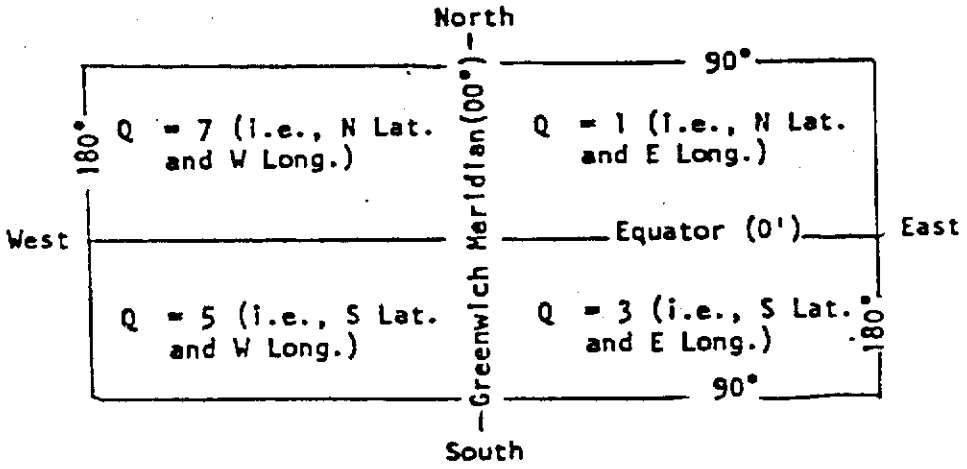
For example: Ship is operating in North Atlantic at 40°N, 30°W on a northwesterly course at a calm water speed of 13 knots (the ship speed is 11 knots) in the prevailing seaway around 10 o'clock in the morning (local time). The wind is from the northwest, and its estimated speed is 19 knots. The resulting waves are from the northwest and observed to be at a height of 2m with an average period of 7 seconds and a length 76m. A single swell train from the west with a height of 1m, a period of 15 seconds, and a length of 350m is observed.

TABLE C-2 – QUARTER CODE (COLUMN 3)



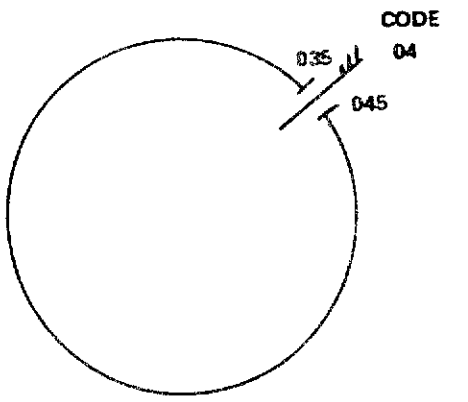
(a) When the ship is precisely on the Greenwich Meridian either code number 1 or 7 (Northern Hemisphere) or code number 3 or 5 (Southern Hemisphere) may be reported, as appropriate with respect to latitude.

(b) When the ship is precisely on the Equator either code number 1 or 3 (Eastern Hemisphere) or code number 5 or 7 (Western Hemisphere) may be reported, as appropriate with respect to longitude.

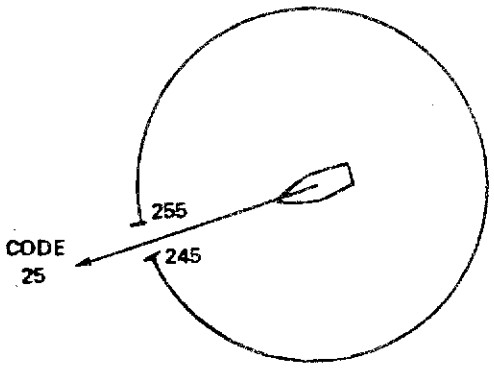
TABLE C-3 – DIRECTION CODE (COLUMNS 5, 8, 12, 16, AND 20)

Code	Direction (FROM which for wind and waves; TOWARDS which for ship course)
00	Calm
01	5 to 14 degrees
02	15 to 24 degrees
03	25 to 34 degrees
04	35 to 44 degrees
05	45 to 54 degrees
06	55 to 64 degrees
07	65 to 74 degrees
08	75 to 84 degrees
09	85 to 94 degrees
10	95 to 104 degrees
11	105 to 114 degrees
12	115 to 124 degrees
13	125 to 134 degrees
14	135 to 144 degrees
15	145 to 154 degrees
16	155 to 164 degrees
17	165 to 174 degrees
18	175 to 184 degrees
19	185 to 194 degrees
20	195 to 204 degrees
21	205 to 214 degrees
22	215 to 224 degrees
23	225 to 234 degrees
24	235 to 244 degrees
25	245 to 254 degrees
26	255 to 264 degrees
27	265 to 274 degrees
28	275 to 284 degrees
29	285 to 294 degrees
30	295 to 304 degrees
31	305 to 314 degrees
32	315 to 324 degrees
33	325 to 334 degrees
34	335 to 344 degrees
35	345 to 354 degrees
36	355 to 4 degrees
99	Variable, confused, direction indeterminate

EXAMPLE:



WIND (SIMILAR FOR WAVES)



COURSE

TABLE C-4 – WIND INDICATOR CODE (COLUMN 9)

Code	Wind
0	Wind speed estimated (in m/s)
1	Wind speed obtained from anemometer (in m/s)
3	Wind speed estimated (in knots)
4	Wind speed obtained from anemometer (in knots)

TABLE C-5 – WIND ELEVATION CODE (COLUMN 11)

Code	Elevation at Observation Point (m)
0	0 – 3
1	3 – 6
2	6 – 9
3	9 – 12
4	12 – 15
5	15 – 18
6	18 – 21
7	21 – 24
8	24 – 27
9	27 – 30
10	30 – 33
11	33 – 36
12	36 – 39
13	39 – 42
14	42 – 45
15	45 – 48
16	48 – 51
17	>51

TABLE C-6 – WAVE HEIGHT CODE
(COLUMNS 13, 17, AND 21)

Code	Wave Height (m)	Code	Wave Height (m)
00	0.25	15	7.5
01	0.5	16	8
02	1	17	8.5
03	1.5	18	9
04	2	19	9.5
05	2.5	90	10
06	3	91	11
07	3.5	92	12
08	4	93	13
09	4.5	94	14
10	5	95	15
11	5.5	96	16
12	6	97	17
13	6.5	98	18
14	7	99	19

ANNEX D to
STANAG 4194

NATO SEA STATE NUMERAL TABLE FOR THE OPEN OCEAN NORTH ATLANTIC

1. A number of sea state numeral tables are in use by mariners throughout the world and, in some cases, they are still used as a description of Sea State in documents, reports, and specifications by navy operators. The numeral scales of these tables are apparently based on different approaches, namely:
   a. Wave appearance (breaking of waves, spray, etc.)
   b. Wind conditions
2. The use of numerals may be misleading if the scale is insufficiently identified. Also the use of a Sea State Numeral Table based on the open ocean for land-locked and/or shallow water areas, or vice versa, causes further confusion.
3. The characterization of wave conditions by means of wave height and a characteristic wave period and/or wavelength is preferred in all cases.
4. If Sea State Numerals are used, it is emphasized that a meaningful definition can only be provided for the open ocean.
5. THE NATO SEA STATE NUMERAL TABLE FOR THE OPEN OCEAN NORTH ATLANTIC is presented in Table D-1. The wave height scale used is that of the World Meteorological Organization (WMO) already adopted by several NATO navies. Associated with each Sea State Numeral are wave statistics derived from the Hindcast Climatology used to develop Figure A-2 of the Source Document. Modal wave period ranges are defined by the minimum (5 percentile) and maximum (95 percentile) values associated with each wave height range. Wind speeds are those which must be sustained in order for fully-developed seas to be generated.

TABLE D-1 – NATO SEA STATE NUMERAL TABLE FOR THE OPEN OCEAN NORTH ATLANTIC

Sea State Number	Significant Wave Height (m)		Sustained Wind Speed (Knots)*		Percentage Probability of Sea State	Modal Wave Period (Sec)	
	Range	Mean	Range	Mean		Range**	Most Probable***
0-1	0-0.1	0.05	0-6	3	0.70	–	–
2	0.1-0.5	0.3	7-10	8.5	6.80	3.3-12.8	7.5
3	0.5-1.25	0.88	11-16	13.5	23.70	5.0-14.8	7.5
4	1.25-2.5	1.88	17-21	19	27.80	6.1-15.2	8.8
5	2.5-4	3.25	22-27	24.5	20.64	8.3-15.5	9.7
6	4-6	5	28-47	37.5	13.15	9.8-16.2	12.4
7	6-9	7.5	48-55	51.5	6.05	11.8-18.5	15.0
8	9-14	11.5	56-63	59.5	1.11	14.2-18.6	16.4
>8	>14	>14	>63	>63	0.05	18.0-23.7	20.0

*Ambient wind sustained at 19.5 m above surface to generate fully-developed seas. To convert to another altitude, H_2, apply $V_2 = V_1(H_2/19.5)^{1/7}$

**Minimum is 5 percentile and maximum is 95 percentile for periods given wave height range.

***Based on periods associated with central frequencies included in Hindcast Climatology.

REVISED MARCH 1984

ANNEX E to
STANAG 4194

DEFINITIONS

Habitability	The ability of a ship's crew to perform their functions, including rest and domestic matters.
Interoperability	The ability of systems, units or forces to provide services to and accept services from other systems, units or forces and to use the services so exchanged to enable them to operate effectively together. (AAP-6)
Modal Wave Period	A characteristic period, in seconds, convenient for use in the specification of mathematically defined wave spectra. It is the period of maximum wave energy and defines the peak location of the spectrum.
Operability	The ability of a ship to perform its missions and tasks.
Predominant Wave Direction	The direction of propagation of maximum wave energy. Herein, it is associated with local wind generated seas rather than swell due to distant storms.
Significant Wave Height	If all the wave heights (peak to trough) of a wave record are measured, the significant wave height is the mean value of the highest one-third of them.
SOWM	The Spectral Ocean Wave Model utilizes archived and well refined wind fields from which directional wave spectra are hindcast at six hour intervals for a continuous period of 20 years. The hindcasts reflect the propagation of wave energy from one location to another as well as the growth and decay of the seaway with local winds.
Swell	A system of waves observed at a point remote from the wind field which produced the waves, or observed when the wind field which generated the waves no longer exists.

Wavelength (Apparent)	The average horizontal distance between successive wave crests or troughs in the direction of advance.
Wave Period (Apparent)	The average time between the passage of two successive wave crests past a fixed point.
Wind Waves (Sea)	A system of waves observed at a point which lies within the wind field producing the waves.

ANNEX F to
STANAG 4194

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