RYA/MCA Yachtmaster Ocean

Narrative Account of the Planning and Execution of the Qualifying Ocean Passage

Marcin Wojtyczka

31.1.2022

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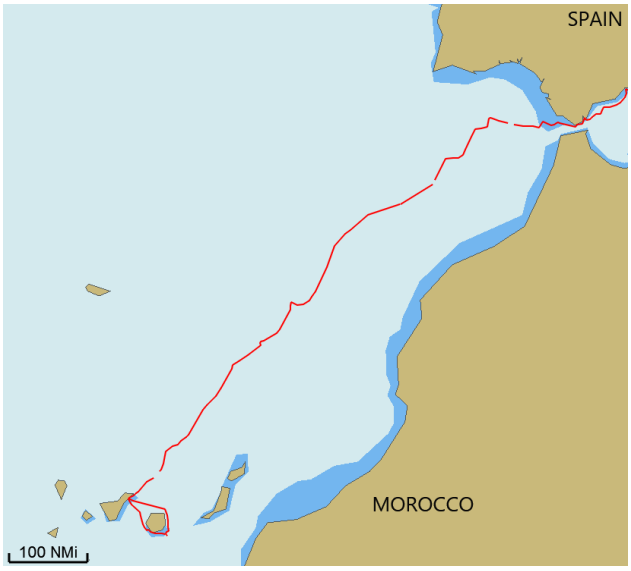
Candidate

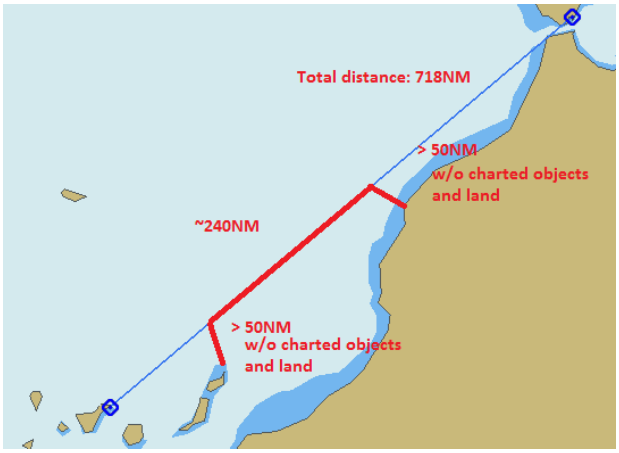
Name	Marcin Wojtyczka
Position on board	Skipper
Qualifications	RYA/MCA Yachtmaster Offshore - Sail (No: 56187) Completed RYA Yachtmaster Ocean Shorebased SCTW RYA SRC RYA Radar RYA First Aid PPR Polish Yacht Association Yachtmaster Unlimited (Sail & Motor) Logged: 15.000 miles

Passage Overview

Passage dates	25.10.2021 - 01.11.2021 (7 days)
Route	Passage on Atlantic Ocean from Gibraltar to Tenerife keeping at least 100NM off Morocco coast. From: Gibraltar (Marina Alcaidesa) To: Tenerife (Marina Santa Cruz de Tenerife)
Total distance	Actual: 845NM



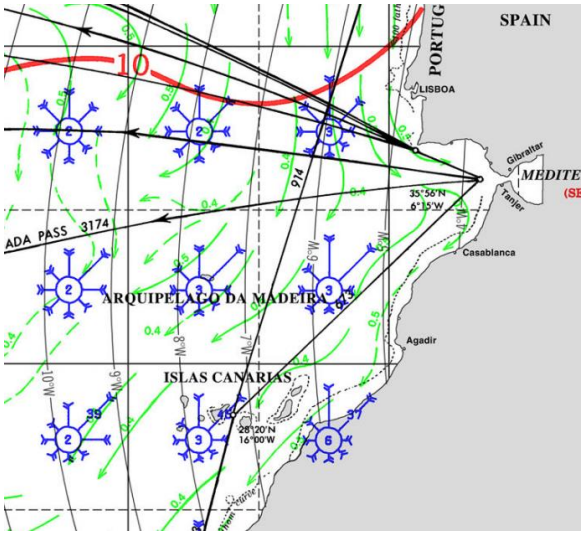
GPS track (presentation purpose only - was not used for navigation)

	Planned: 750NM * 20% = 900NM (added 10-20% to the theoretical distance as sailing boats rarely sail in straight lines).  *Waypoints (presentation purpose only -was not used for navigation)* Rhumb line: 718NM  *Distance (presentation purpose only - was not used for navigation)*
Over 50NM from land	Actual: 645NM Rhumb line: 240NM 

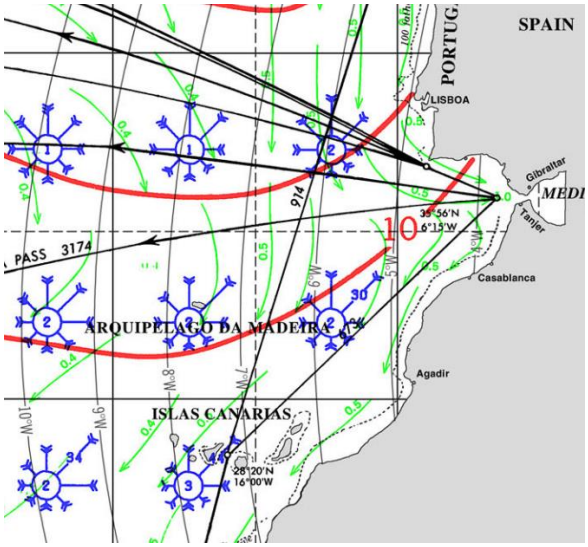
Estimated speed	Average: 5kt Max (sails): 8kt Max (engine): 6kt
Duration of voyage	Actual: 7.5 days (175h) Expected: 7.5 days (180h) Possible (max expected): 9 days (added 20% to allow for no wind, rig failure or adverse conditions)
Vessel	S/Y Katalina, Oceanis 41, 2012, modern performance cruiser MMSI: 225951220, Official number: 6ª TE-1-9-12 L.O.A: 12.43m Beam: 4.2m Draught: 1.7m (short draught fin keel) 3 cabins, max 8 people Water tanks: 570L Fuel tank: 200L Engine: 56HP 2 toilets and shower Sloop with classical mainsail and headsail on furler Kitchen: oven, cooker, sink, fridge and freezer CE Design: Cat A 
Crew on board	7 (including skipper) qualified and experienced sailors.
Navigation	The complete passage was executed using traditional methods of position fixing. GPS was carried as a backup and run for tracking purposes but was not used for the actual navigation. Position fixing methods used: • Coastal: 3-point fix, bearing and depth contour, bearing and distance from vertical sextant angle, bearing and distance from dipping • Offshore (out of sight of land): dead reckoning and celestial navigation

General Meteorological Conditions Expected

Due to Azores high the northerly winds (so called Portuguese trades) blow consistently in the sailing area and the southbound passage is aided by the favourable current both of which can be observed on the pilot charts (see below). In October the winds are less constant, although their direction continues to be predominantly northerly. November has a higher incidence of winds from other directions, but winds from the northern quarter are still in the majority. Strong SW winds with rough seas may be encountered by sailing this route after the end of October. Therefore, the trip should not be delayed if possible. Better sailing conditions are usually found further off the African coast so the preferred route should follow the Spanish coast until it is safe to set a direct course to Tenerife.



Admiralty Pilot Charts (October)



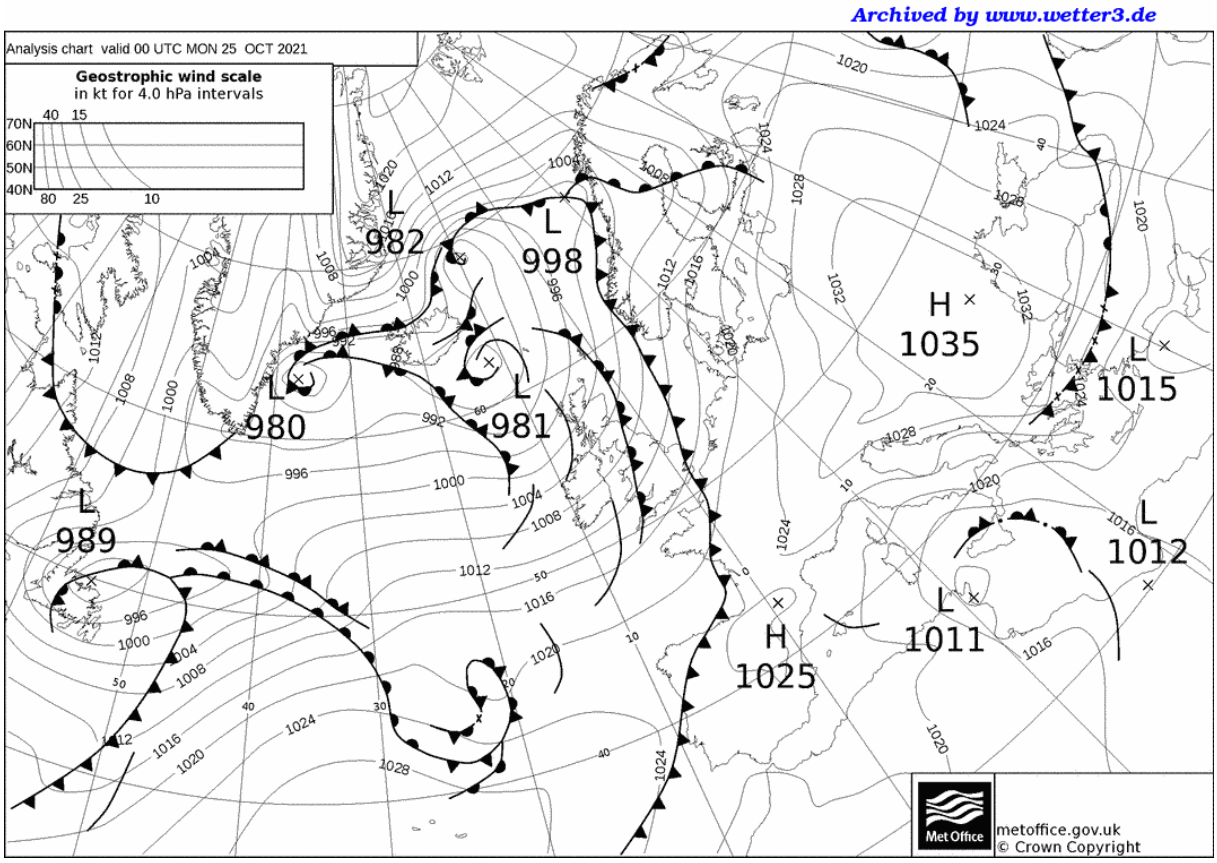
Admiralty Pilot Charts (November)

On the synoptic surface and 500mb pressure charts (see below) we can observe that an extensive high system located over Western Europe and on the Iberian Peninsula is effectively blocking low pressure systems formed on the Atlantic to run eastward. The high-pressure systems are expected to slowly retract north-east in the next days with the upper-level trough over Greenland strengthening/digging south-eastward. However, it is unlikely that an Atlantic low can creep in as far as Canaries.

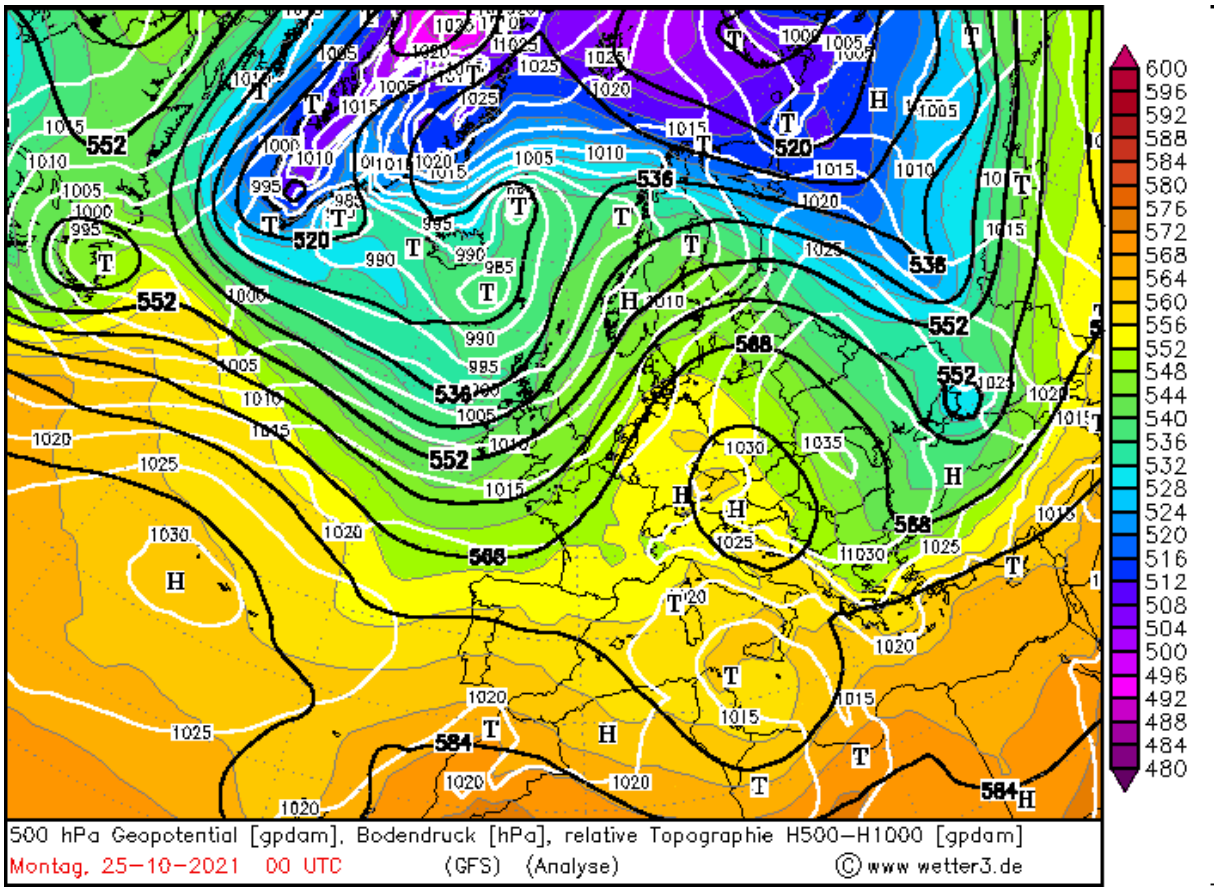
There is a mild pressure gradient over the planned sailing area therefore strong winds are not expected on the open ocean. There is a cold front coming from north-west in the first days but it is weakening with no significant difference in the warmth of the air and eventually dissipating. That being said the conditions in the Gibraltar Strait and some miles outside will be different due to wind funnelling between high lands in the Strait. Winds in excess of 30 knots are said to blow in the Strait for 300 days of the year. The weather forecast checked before departure showed a strong breeze in the first 2 days coming from the Gibraltar Strait producing excellent sailing conditions. This could be partially because of the local landscape structure and partially because of sharply curved upper-level shortwave trough located over Atlantic Spain. The trough has weak divergence, south-west “positive tilt” and is weakening in coming days so the wind is expected to slowly go down.

A high swell could be encountered in the open ocean as deep low was travelling from US towards Europe in the last few days generating high sea state with swell travelling as far as Portugal and Canaries. Avoidance strategy, would be to shelter behind Spanish/Portugal coast as long as possible before turning south.

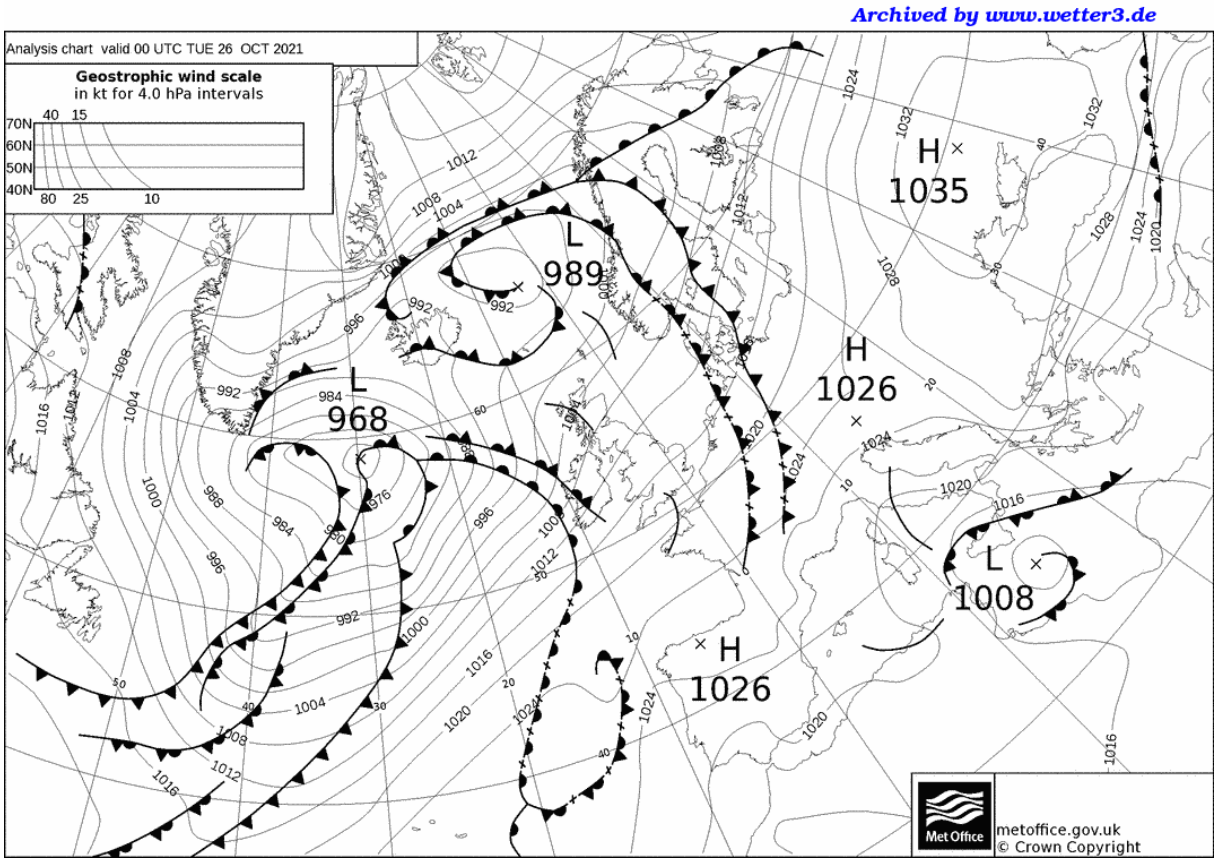
From celestial navigation stand point of view, the weather in the first 1-2 days was not perfect as stratocumulus clouds were predicted. A long tail of the clouds can also be observed on the satellite images from the day of departure (see below). Nevertheless, the sky was expected to clear up later.



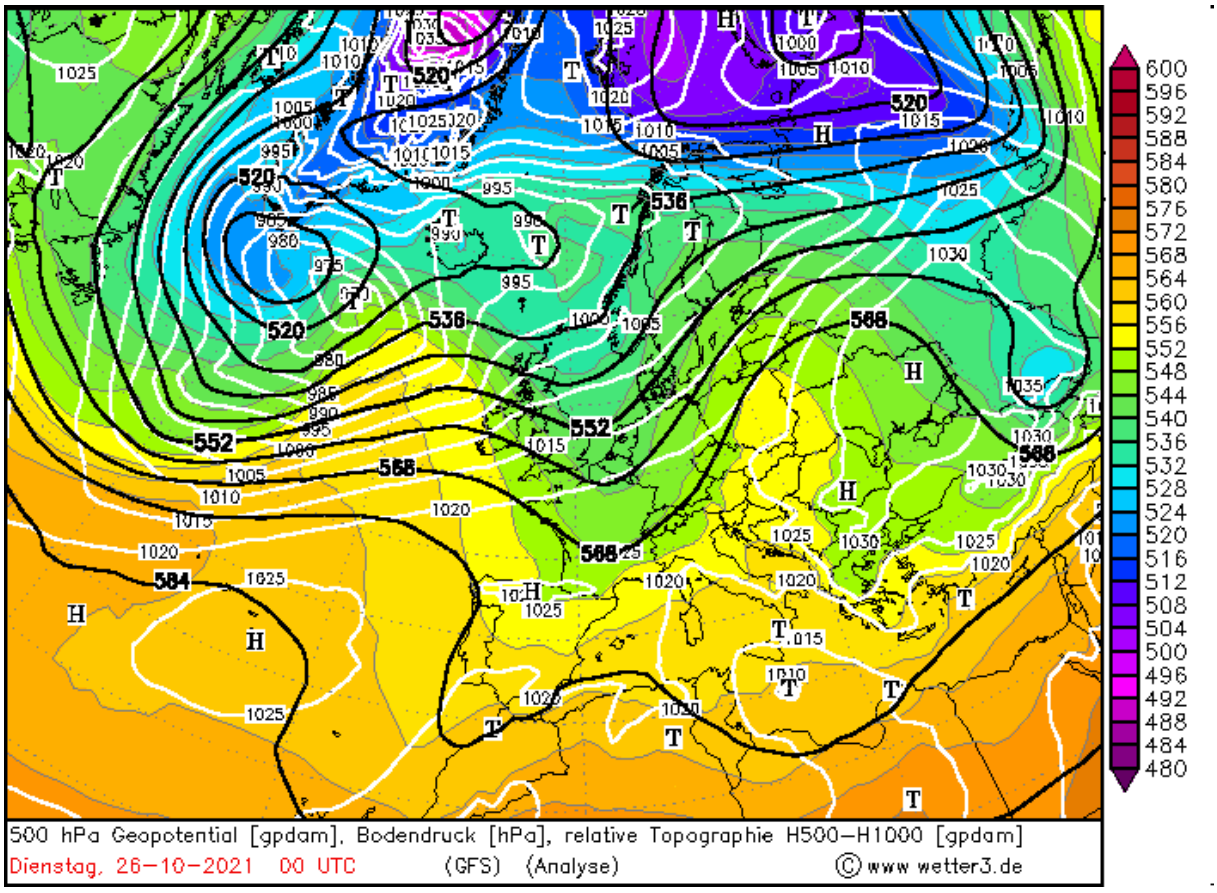
Surface pressure chart (25.10)



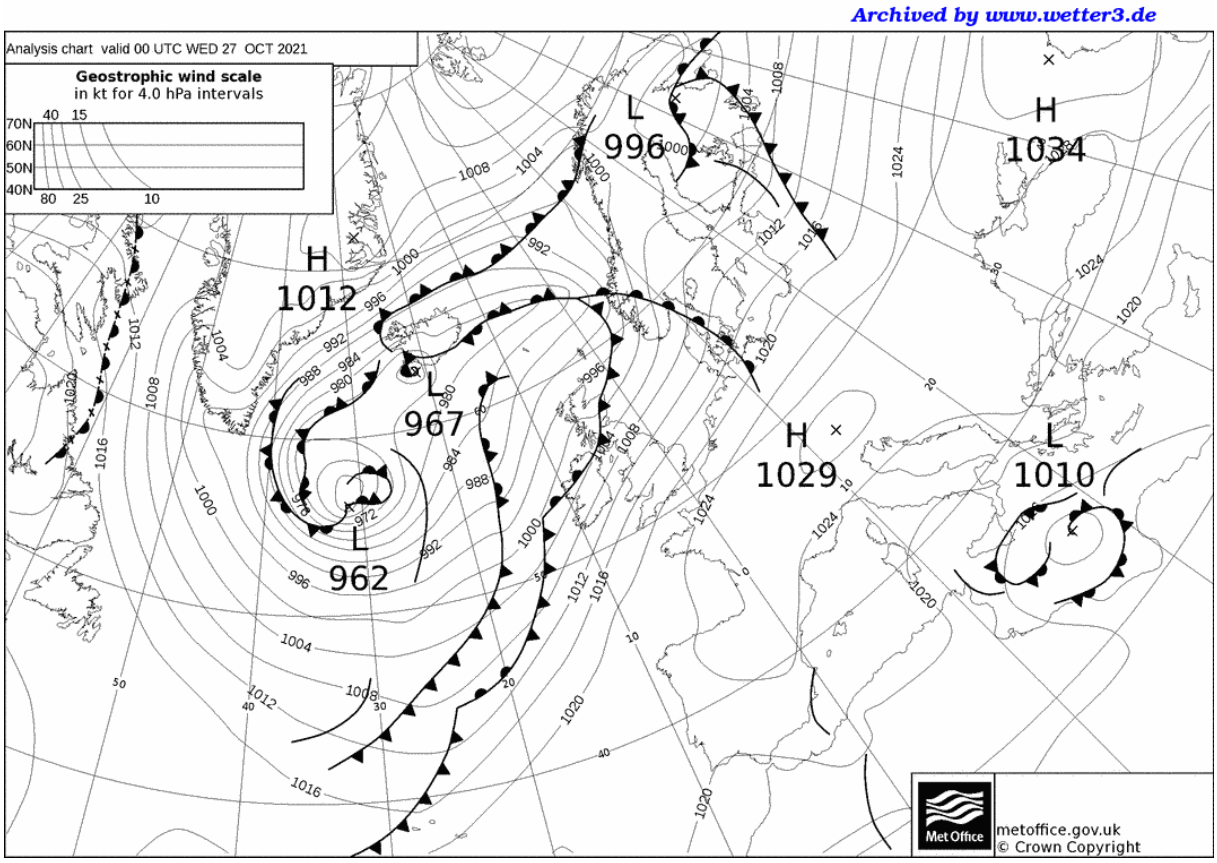
500mb pressure chart (25.10)



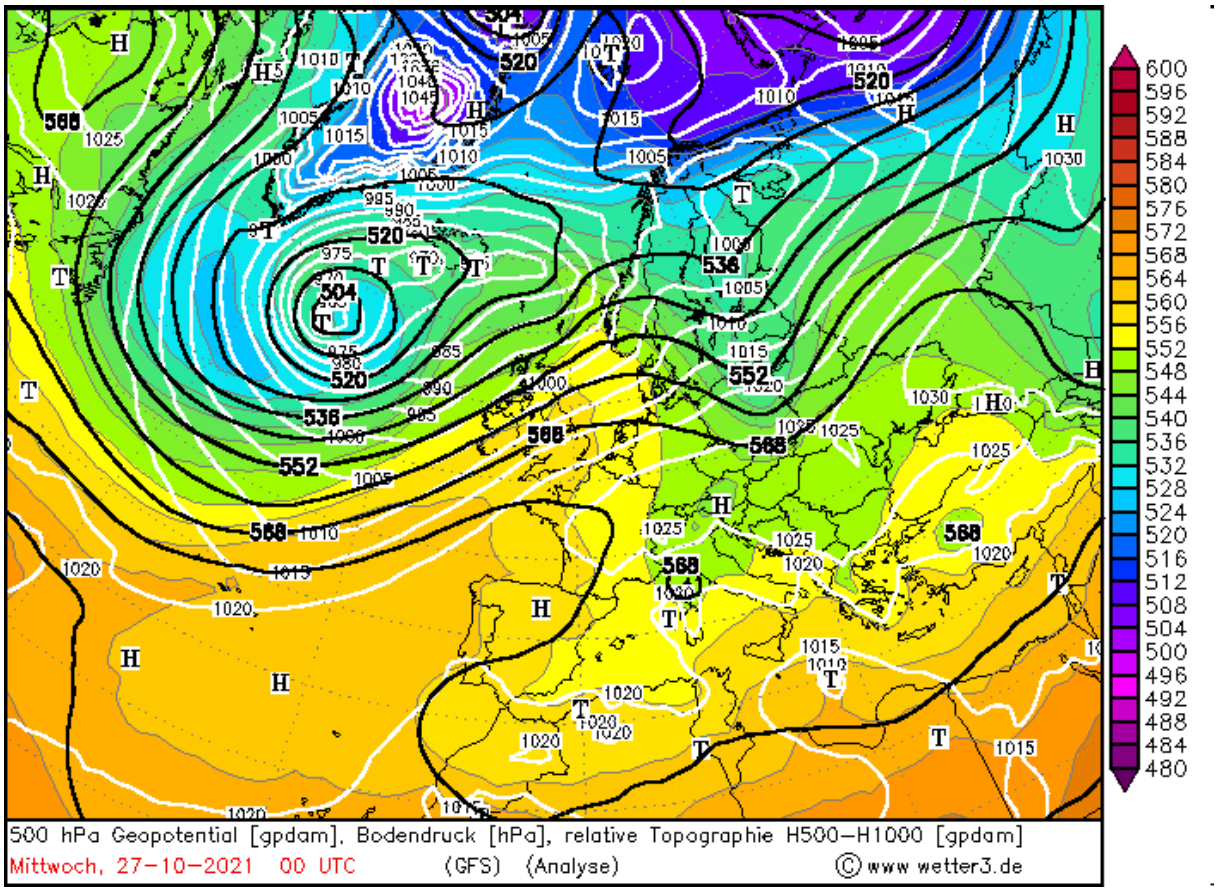
Surface pressure chart (26.10)



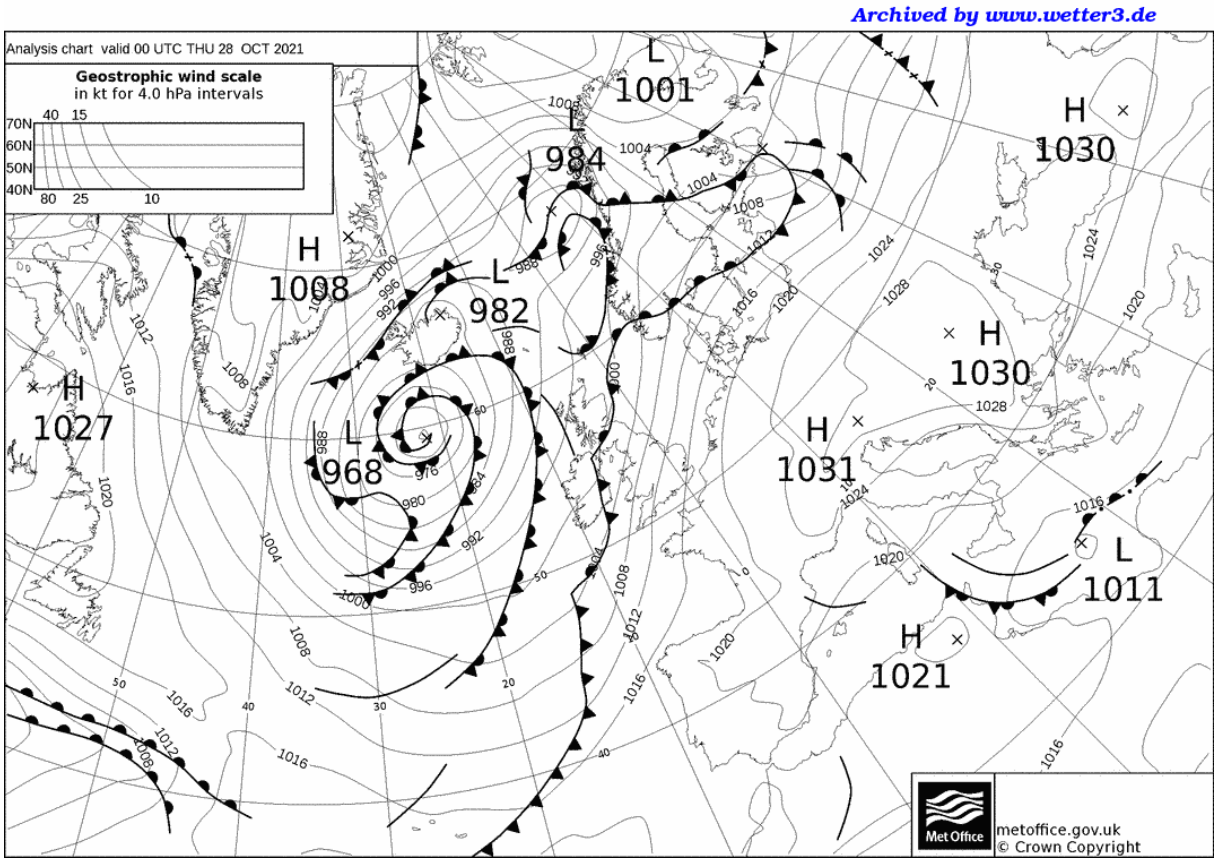
500mb pressure chart (26.10)



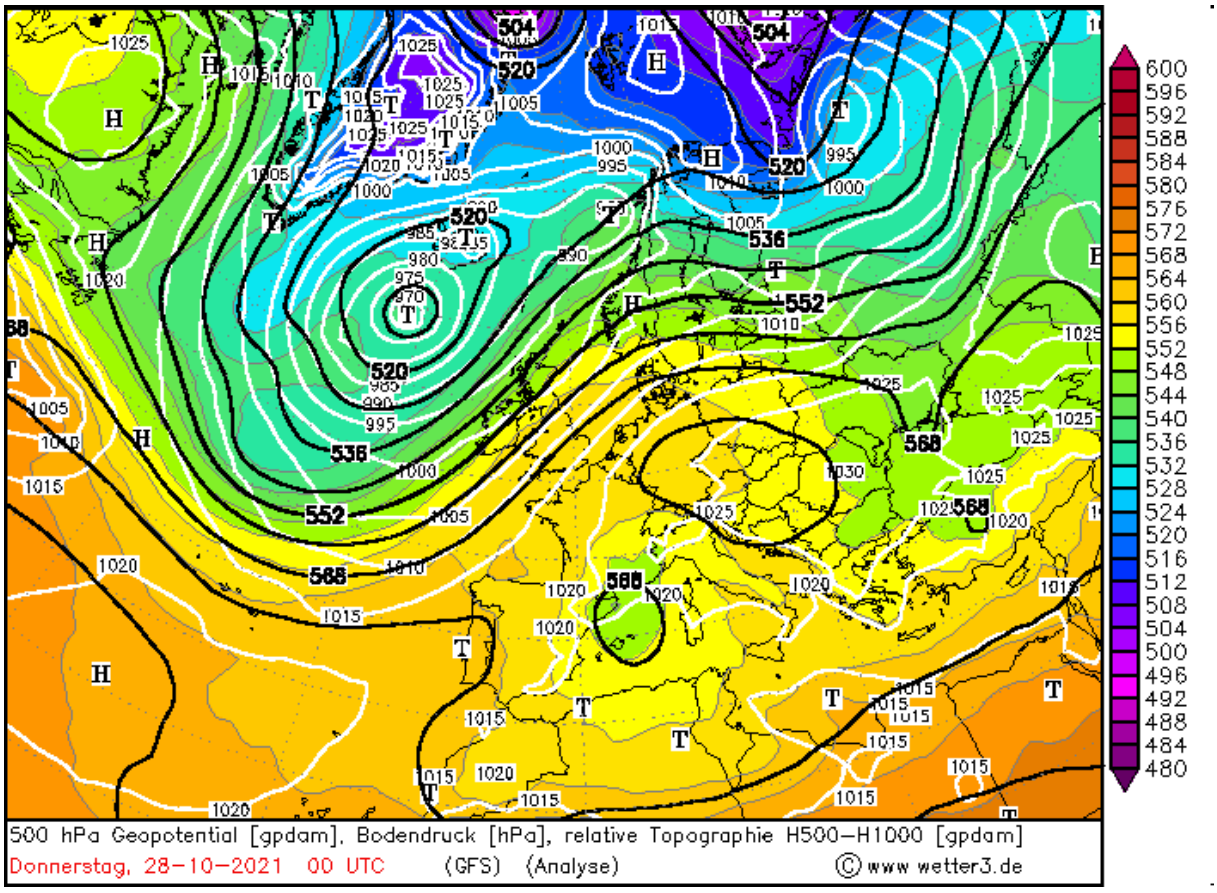
Surface pressure chart (27.10)



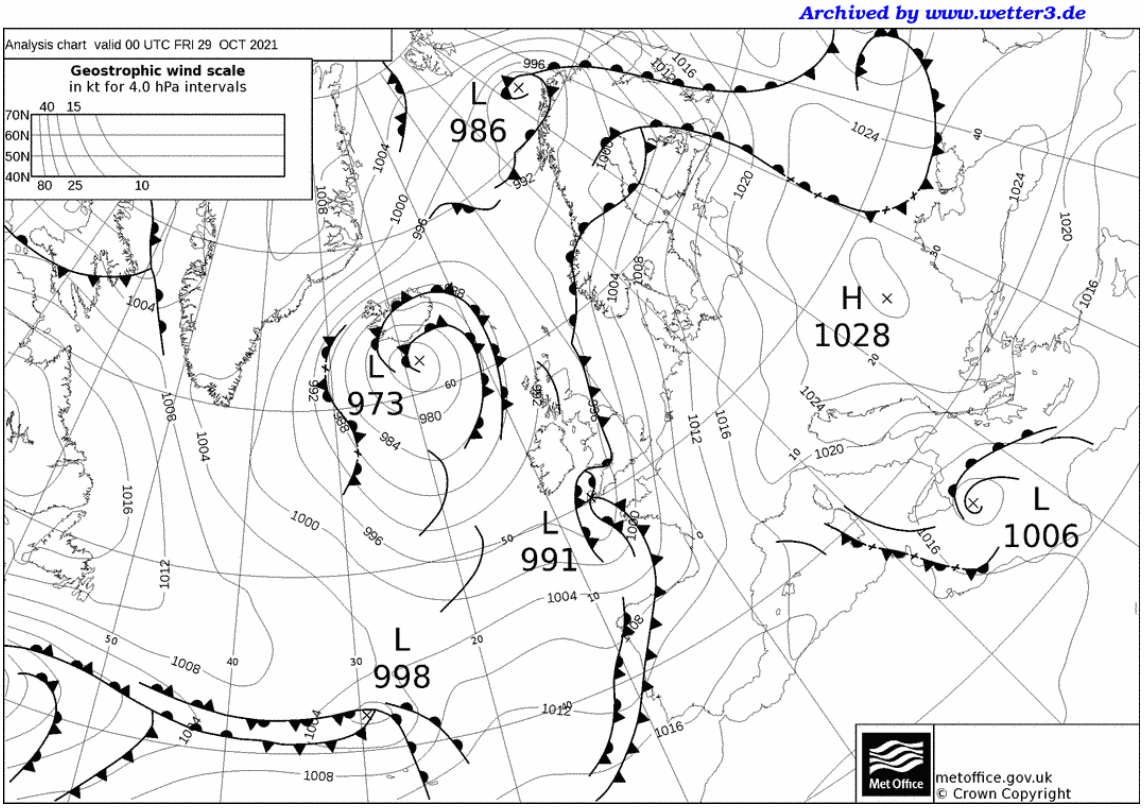
500mb pressure chart (27.10)



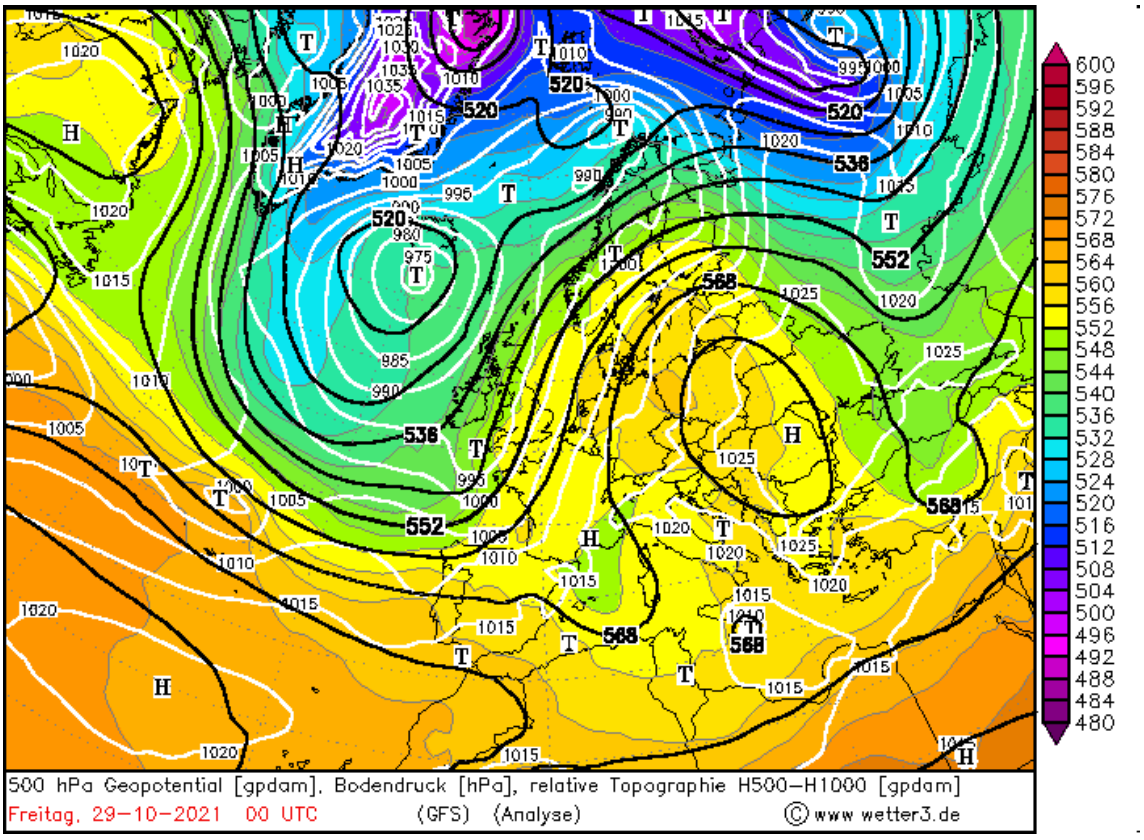
Surface pressure chart (28.10)



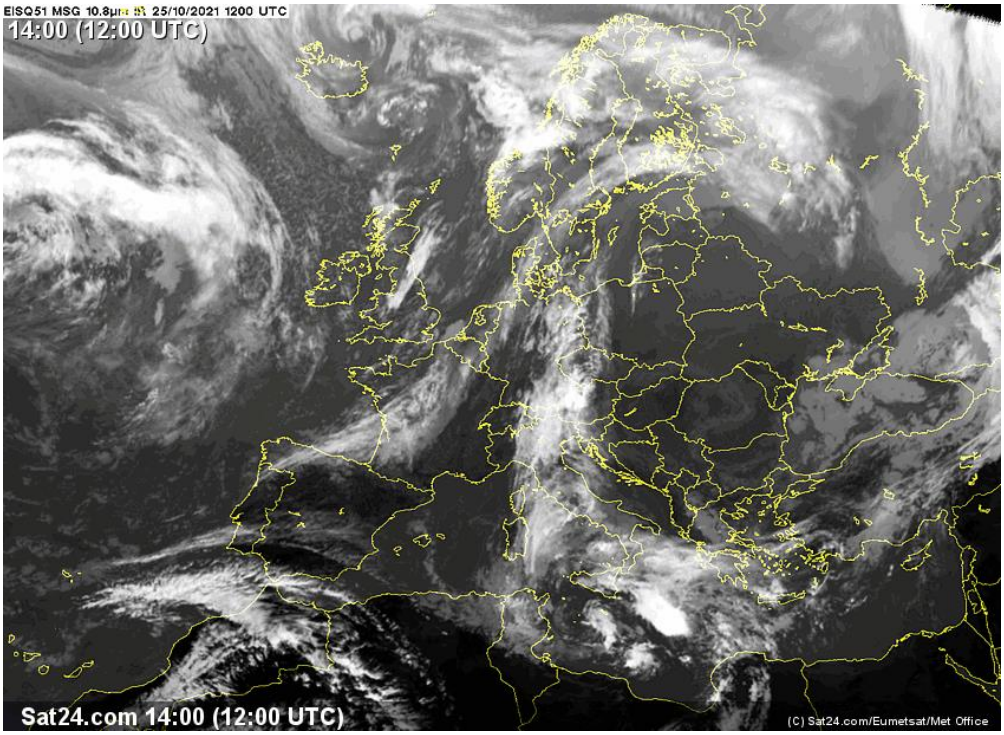
500mb pressure chart (28.10)



Surface pressure chart (29.10)



500mb pressure chart (29.10)



Snapshot of current "weather" from geostationary satellite image at the day of departure (25.10)

Weather Sources

Before departure

Weather information was sourced before departure in Gibraltar using:

- PredictWind Offshore application (Spire, ECMWF, GFS models)
- Online services for synoptic charts: UKME – covering Atlantic Europe, Ocean Prediction Center – covering entire North Atlantic Ocean
- Satellite images (Sat24/Eumetsat)

The complete weather information sourced contained the following information:

- Surface pressure charts
- 500mb pressure charts
- Satellite images
- Wind speed 10 meters and wind gusts
- Significant wave height and period
- Rain
- Visibility
- Cloud coverage

En route

Iridium Go Satellite Hub with PredictWind Offshore application (installed on laptop and smartphone) was used offshore to get fresh weather information twice a day (morning and evening).

The following parameters were downloaded to limit the amount of data:

- GMDSS forecasts
- Grib files: Spire, ECMWF and GFS models with 50km resolution, 6 hourly interval, 7 days, limited to wind speed, pressure, wave height and period, wind gust, cloud coverage
- Weather routing based on the selected models

Passage Plan

Coastal Passage Plan Proforma

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Yacht name: Katalina LOA: 12.59 m Draught: 1.7 m Beam: 4.3 m

Trip details

Date of trip	25.10.2021	Total distance	750 NM
Departure point	Gibraltar (Algeciras)	Arrival point	Marina Tenerife (Darsena Pesquera)
Departure time & date (local)	~~13.00~~ 15:00	Arrival time and date	01.11.2021
Intended stops	-		
Alternative ports	Tarifa, Cadiz, Funchal, Casablanca, Agadir, Santa Cruz		
Estimated speed	5kt	Magnetic variation	Bay of Cadiz 1°W Open ocean 3°W

Weather

Weather Source:	Predict Wind		
Sea area	Bay of Cadiz, N. Atlantic, Canaries		
Wind direction and strength (+ gusts)	NE 3-6, NW 3-4 later	Wave height & period	2.8m 11s, later 1.8m 8s
Thunderstorms / rain	-	Visibility (including fog)	Good

Major Hazards

Name & Description	Location	Avoidance strategy/ Risk mitigation
Strait of Gibraltar		keep clear of TSS and wrecks.
Peninsula of Punta de Paquete	NE of Tenerife.	

Wind Acceleration around NE Limits of Tenerife } Reef down before entering these areas
in the Gibraltar Strait

Navigational aids

Name & Description	Location	Characteristics
Tarif Lt.	Strait of Gibraltar	FL(3) WR 20s 51m 18M
Cabo Trafalgar	- " -	FL(2+1) W 15s 50m 22M
Cap Spartel	- " -	FL(4) W 20s 85m 30M

Bancs de Dacia N of Canaries Shallow 27m

Tidal gates

Name & Location	Window of opportunity
Gibraltar Strait	2h after HW

From personal template: https://bluewatermiles.com/docs/navigation-proformas.pdf

M11 Gibraltar to Cabo de Gata and Morocco

Required charts: ~~C20 Strait Of~~ Gibraltar to Arquipélago dos Açores and Islas Canarias

Waypoint list

WPT #	WPT	Lat/ Long	Distance to next	BRG to next	Remarks, navigational aids, hazards
~~1~~	~~Tarif~~	~~35°57'6N 007°53'2W~~	~~110NM~~	~~269°~~	~~Tarif Lt., C. Spartel Trafalgar~~ → fix
~~2~~	~~Cadiz Golf~~	~~31°18'1N 013°51'9W~~	~~410NM~~	~~227°~~	
~~3~~	~~Dacia Seamount~~	~~28°31'2N 016°05'2N~~	~~203NM~~	~~215°~~	
11	Tarif	35°59'3N 005°36'6W	110NM	269°T	Tarif Lt. C. Spartel Trafalgar → fix
2	Cadiz Golf	35°57'8N 007°52'9W	410NM	227°T	
3	Dacia Seamount	31°18'3N 013°57'8W	203NM	~~214°T~~ 216°T	
4	Tenerife	28°31'1N 016°05.2W	6.8NM ~~255NM~~	255°T	
5	Marina Tenerife	28°29'5N 016°12'6W	–	–	pilotage

Offshore Passage Plan Proforma

Additional considerations for offshore/ocean passages

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Consumables

	Capacity	Consumption rate	Range	Extra supplies?
Water	Tanks: 570L Bottles: 200L	Drinking: 3L/day/person? Cooking: 4L/day/person? Shower: 40L/person/week? 7x140L personal hygiene 1L/p/d	56L/day 12days	Bottles
Food			8days	2 days
Electricity	90Ah (Engine) 1x110Ah	120 Ah/day		
Fuel	200L	3L/h, 2h/day - charge Batteries	500 NM	100 62L (jerry cans) 5x
Gas	2 Bottles (3 kg)	1 per week	2 weeks	

General weather conditions

	Start of trip	Middle of trip	End of trip
Wind direction and strength (+gusts)	NE 19 (25)	NE 16 (19)	NE 7 (9)
Gale frequency	1	0	0
Swell direction & height (+period)	2.8m (12s), SE	2.4m (10s), S	1.8m (10s), SE
Current	S 0.5kt	S 0.5kt	SW 0.5kt
Sea temp	20	20	22
Visibility	Good	Good	Good
Special precautions	-	-	-
Weather sources	Predict Wind (ECMWF, GFS, Spire)	- " -	- " -

Communications

	Name/ Location	Reporting requirements	Contact details
*MRCC Departure country	Tarifa	SRR	+34 956 684 740
**Customs Departure port	-		
**Immigration Departure port	-		
MRCC Arrival country	Tenerife	SRR	+34 922 537 551
Customs Arrival country	-		
Immigration Arrival Country	-		
Shore contact	Anna Wojtyczka		+48 692 755 345 ann.wojtyczka@gmail.com

*https://sarcontacts.info

**https://www.noonsite.com

Waypoints placed on offshore chart

Deciding on strategy and route selection

Based on the weather forecast the best sailing conditions should be found further away from African coast. There is also considerably less shipping when going more offshore compared to a more direct route along the Morocco coast.

There was a swell of 3.4m (12s period) predicted for the first 2 days (25-26.10) coming from NW. The swell was starting south of imaginary rhumb line from Cabo de Sao Vicente to Casablanca. It was generated by a deep low traveling in the past few days from US towards England. The area from Gibraltar Strait until Cabo de Sao Vicente was well protected from the swell by Iberian Peninsula. Therefore, starting on a westerly course initially for the first 1-2 days made sense to avoid the worst conditions. The swell had a large period so the waves won't break in deep sea but it will eventually meet cross sea coming from Gibraltar that could create rough sea conditions. By the time we were supposed to enter the affected area, the swell was predicted to go down to a more comfortable level (2.8m/12s at 27.10, 2.4m/10s at 28.10, …) giving the crew more time to get their sea leg.

Based on the above considerations, the route was set to 269^{o} (T) from Gibraltar Strait for 110NM before turning more south to 227^{o} (T). The course from there was set to pass Dacia Seamount to port as the shallow could potentially produce more difficult sea in long swell. Once the shallow is cleared the course could be set to 214^{o} (T) – straight to Tenerife.

Estimating passage time

The total distance is 750NM. After adding allowance of 20% for not sailing in straight lines, the distance is 900NM. With the estimated speed of 5kt it should take 7.5 days (180h). However, things are not always ideal and it is prudent to add 20-30% or so of safety margin. With that in mind the maximum passage time was estimated to 9 days.

Great circle considerations

The route was more south than westerly bound and was optimized to get the best weather/sailing conditions therefore the great circle was not considered.

Pilotage out of Marina Algeciras

Pilotage Plan Proforma

www.bluewatermiles.com

Harbour name: Gibraltar (Algeciras) — Going out of Gibraltar

Date: 25.10.2021

VHF channels: 9

Tidal Standard Port: Gibraltar

Tidal Secondary Port details: —

	Time	Height	Direction (Set)	Rate
High water	06:18 AM	0.86m	See Tidal	Atlas
Low water	11:47 AM	0.32m		
High water	06:25 PM	0.85m		
Low water				

Approach way point / Navigational aid: Europa Point / Pte Carnero

Shelter: Good from all directions

Type of berth: Pontoon

Minimum under keel clearance: 1m Nature of seabed: Sand

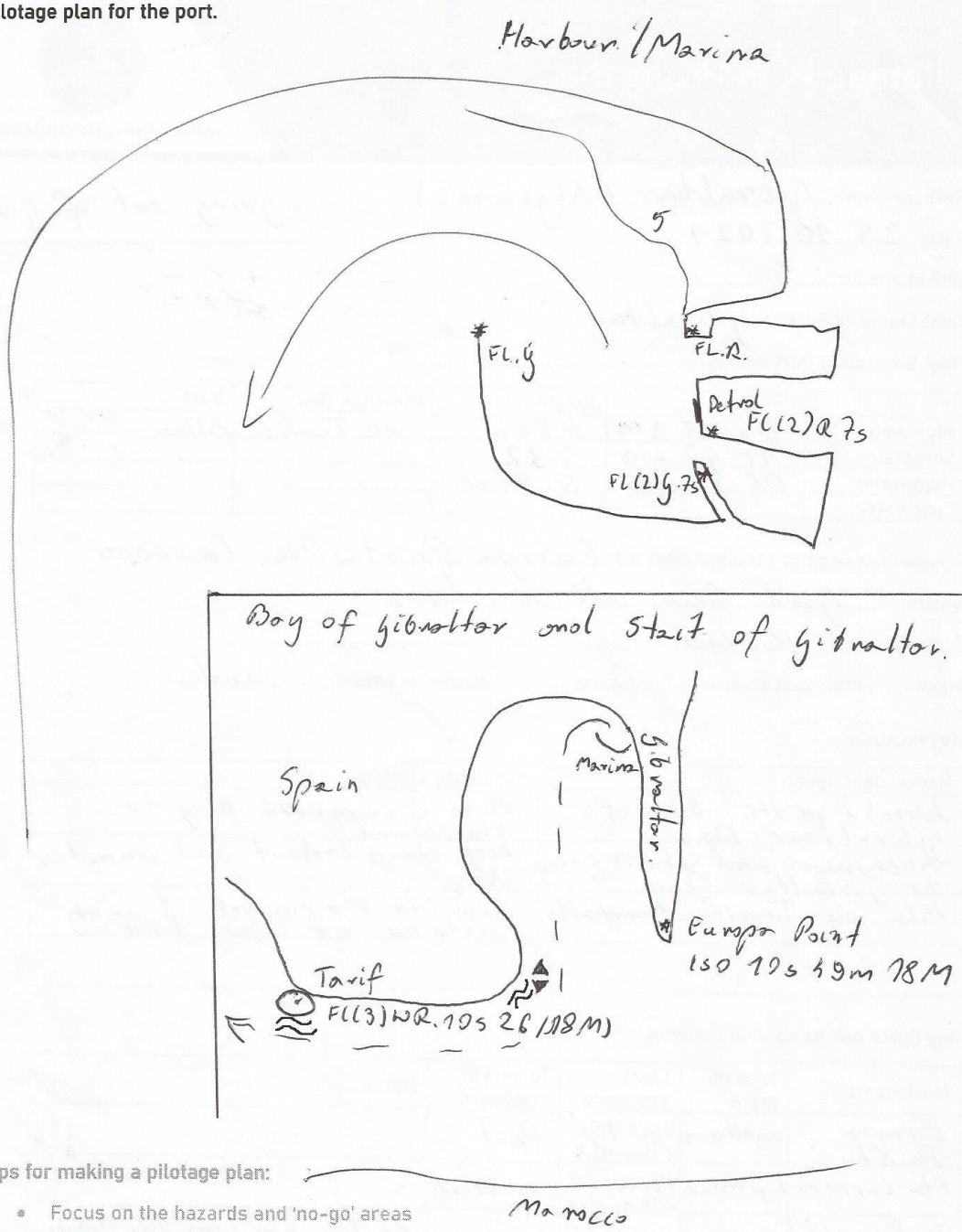
Key hazards

Name/ description	Avoidance strategy
Wrecks on the SW of Gibraltar Bay	Pass E cardinal buoy to starboard
Anchorages and ships going to Gibraltar Bay	keep sharp lookout and monitor AIS
Isla de Tarifa overfalls	Pass to starboard, keeping distance at about 1NM
Wind acceleration in the Gibraltar Strait	Reef down before entering this area.

Key lights and navigational marks

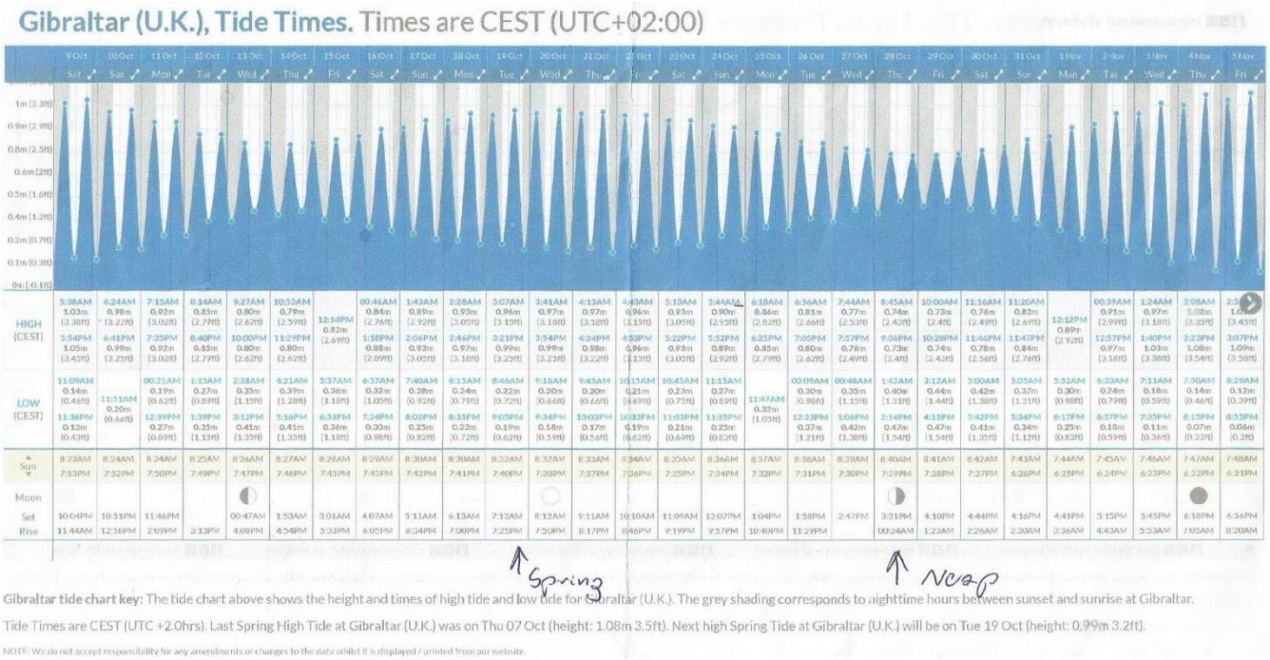
Mark name	Type of mark	Light sequence	To port or starboard	Notes
Europa Point	Lighthouse	Iso 10s 49m 18M	Port	
Pte Carnero	Lighthouse	FL(4)WR 20s 16/13M	Starboard	
East cardinal buoy	Buoy	VQ(3) 5s 3M	Starboard	At the SW end of Bay of Gibraltar
Tarifa	Lighthouse	FL(3)WR 10s 26/18M	Starboard	
South Cardinal buoy	Buoy	Mo(D)60s Q(6)	Starboard	NW of Tarifa (pos. fix)
C. Trafalgar Lt.		FL(2+1) 15s 22M	starboard port.	pos. fix
C. Spartel Lt				

Pilotage plan for the port.



Tips for making a pilotage plan:

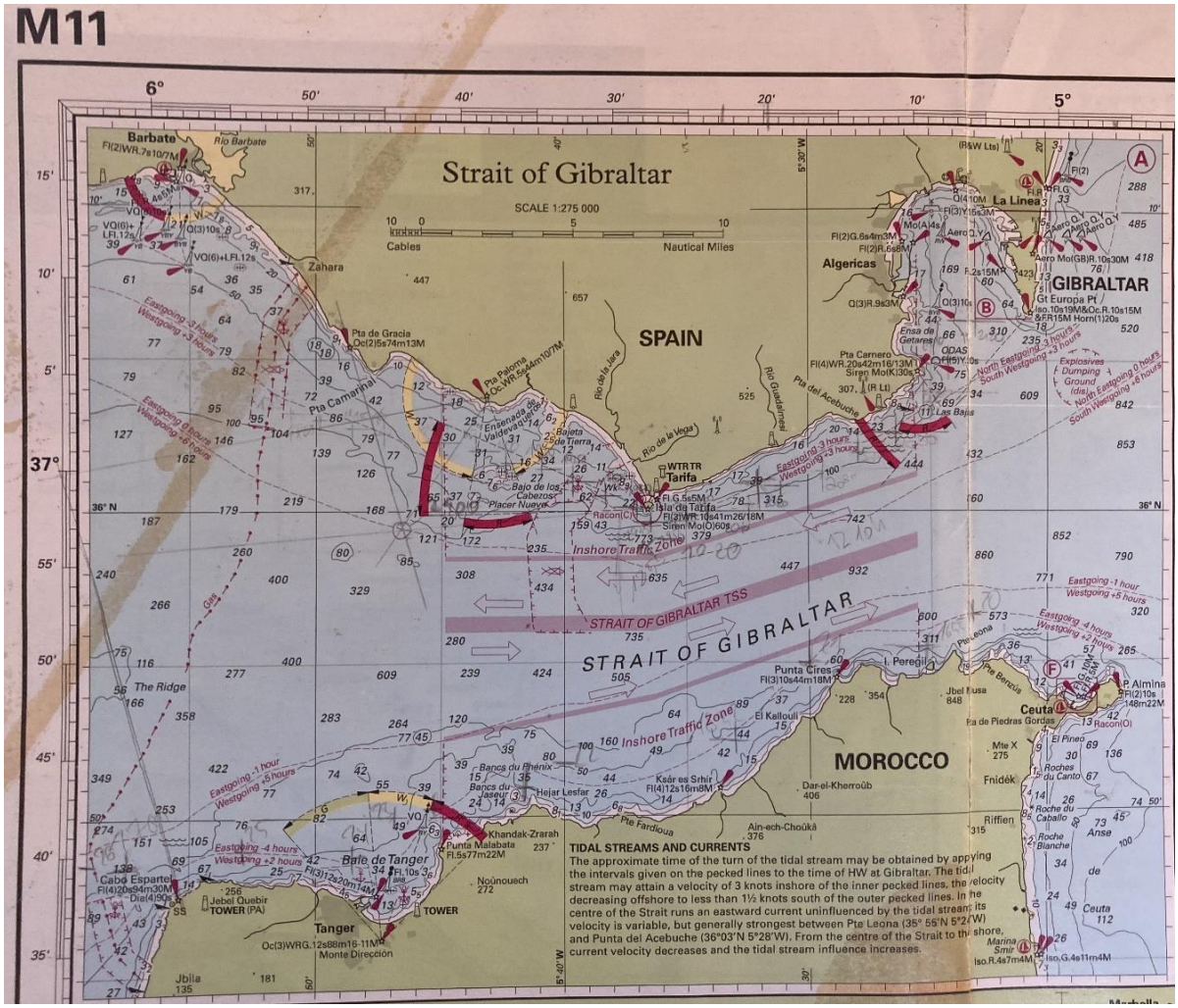
- Focus on the hazards and 'no-go' areas
- Have an idea of the scale
- Maintain safe below keel clearances
- Filter out irrelevant information
- Know how you will monitor the vessel's position at each stage
- Make it graphical with or without land features depending on your preference (http://www.sailtrain.co.uk/pilotage/pilotage_plans.htm)



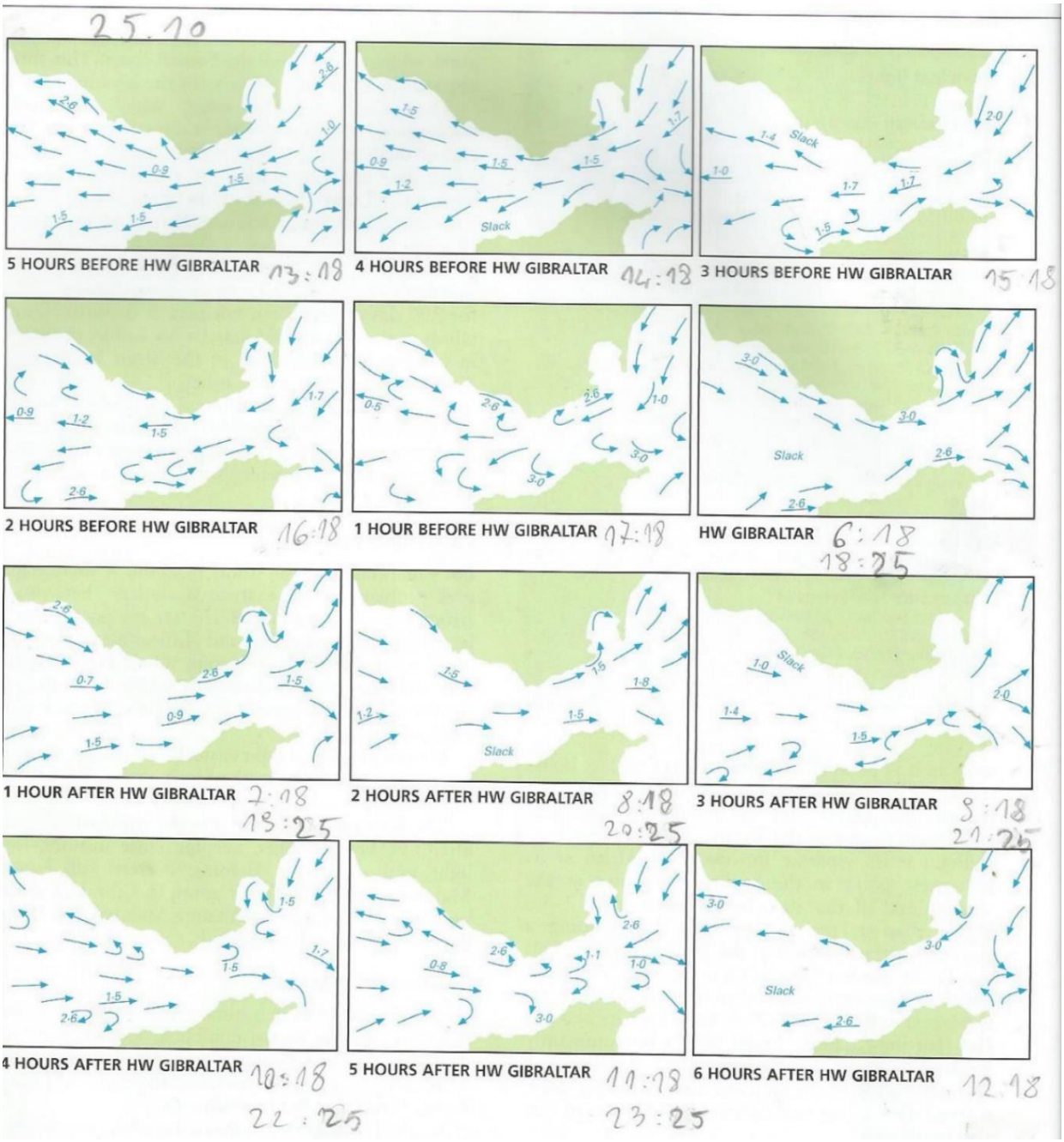
Tides prediction for Gibraltar (Standard Port)

Due to tidal streams, tides have to be considered when passing the Gibraltar Strait but can generally be skipped for the purpose of keeping enough under keel clearance in the Marina Algeciras since the minimal depth in the marina is 3m.

Pilotage out of Gibraltar Strait



Pilotage and tidal streams situation in Gibraltar Strait



Tidal atlas with hours drawn for the date of departure

In Strait of Gibraltar the surface water flow is the product of combination of current (wind driven) and tidal stream (tides driven), the former dominant. In strong westerlies it is impossible for a sailing yacht to make headway W, due to the combined E-going current that can, with unfavourable tide, reach 6 knots or more, with heavy steep swell and overfalls off Tarifa and Punta Carnero. However, in good conditions (especially not very strong easterly winds) the passage should not pose issues. The general recommendation for westbound vessels is to set off from Gibraltar at HW+2, keeping close inshore in the Strait to make use of the tidal stream that runs close inshore.

The following goals for going through the Strait were set:

- Avoid crossing Traffic Separation Scheme due to potentially high concentration of shipping
- Pass the Strait during daylight time to ease the navigation and to be able to admire the views
- Set out not earlier than 25.10 afternoon to finish last preparations (provisioning and fixing minor issues with the boat)

The HW during the day of departure (25.10) was at 0618 and 1825. It was impossible to leave in the morning due to ongoing preparations. On the other hand, leaving at 1825 would mean that we have to go through the Strait overnight.

Options considered:

1) Delay the passage by one day and start in the next morning. That would mean we have almost one day less on the ocean with good NE wind.
2) Start at HW-3 (1500 – the earlier the better) at the planned departure day. This is not ideal from the tidal stream perspective. However, taking into consideration that easterly wind of 20-26kt in the Strait was blowing in the last few days we should actually expect westerly current in the Strait all the way. The tides are closer to Neap than Spring therefore we should also not expect strong tidal stream. In fact, the stream should be favourable for the first 3 hours if we keep close to the TSS – 2NM off shore. This is because in the centre of the Strait to the shore, current velocity decreases and the tidal stream influence increases. This strategy should be enough to pass Tarifa point and head out to the open ocean without engine. Keeping 2NM off shore in the Strait will also make sure that we avoid any overfalls off Isla de Tarifa and off Punta Carnero. We just have to make sure not to cross the TSS that runs in the middle of the Strait.
   In case we encounter a strong stream near Tarifa making the headway impossible or inefficient, we could pull out to the Tarifa harbour or anchor NW of Tarifa (protected from Easterly winds) for a few hours, and wait for the tide to turn.

The option 1) was chosen. As predicted, the tidal stream was not noticeable and we did not have to stop at Tarifa or use engine to exit to the open ocean.

Pilotage Plan Proforma

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Harbour name: Tarifa

Date: 25.10.2021

VHF channels: 10, 67

Tidal Standard Port: Gibraltar

Tidal Secondary Port details: HW -0040, LW -0040 MHWS 1.4 MHWN 1.0 MLLWN 0.6 MLWS 0.3

	Time	Height	Direction (Set)	Rate
High water	05:38 AM	1.1 m		
Low water	11:07 AM	0.5 m		
High water	05:45 PM	1.1 m		
Low water				

Approach way point / Navigational aid: Statue on starboard head (east breakwater)

Shelter: Good once inside ~~to~~ (pass) starboard head

Type of berth: Concrete mole

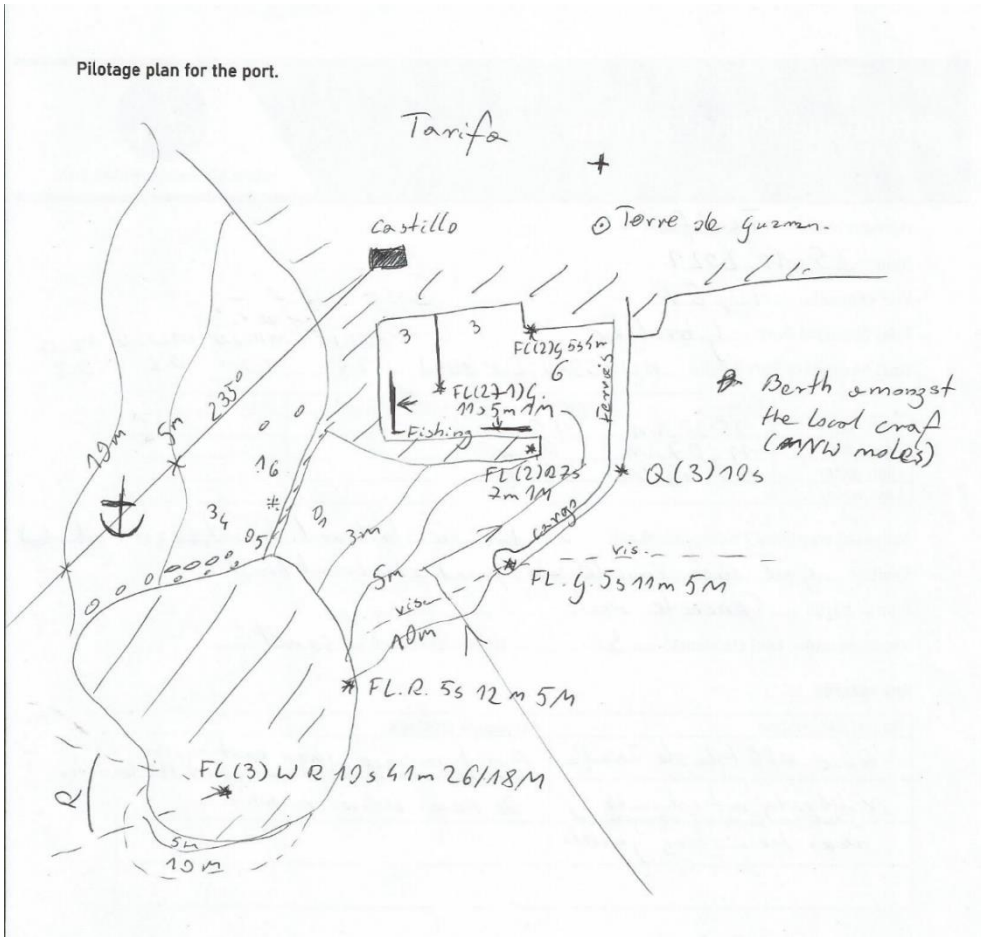
Minimum under keel clearance: 3 Nature of seabed: sand

Key hazards

Name/ description	Avoidance strategy
Race off Isla de Tarifa	Avoid passage when east-going current and tidal stream oppose the Levanter
Night entry not advisable due to lack of designated places for visiting yachts.	Be there before night time.

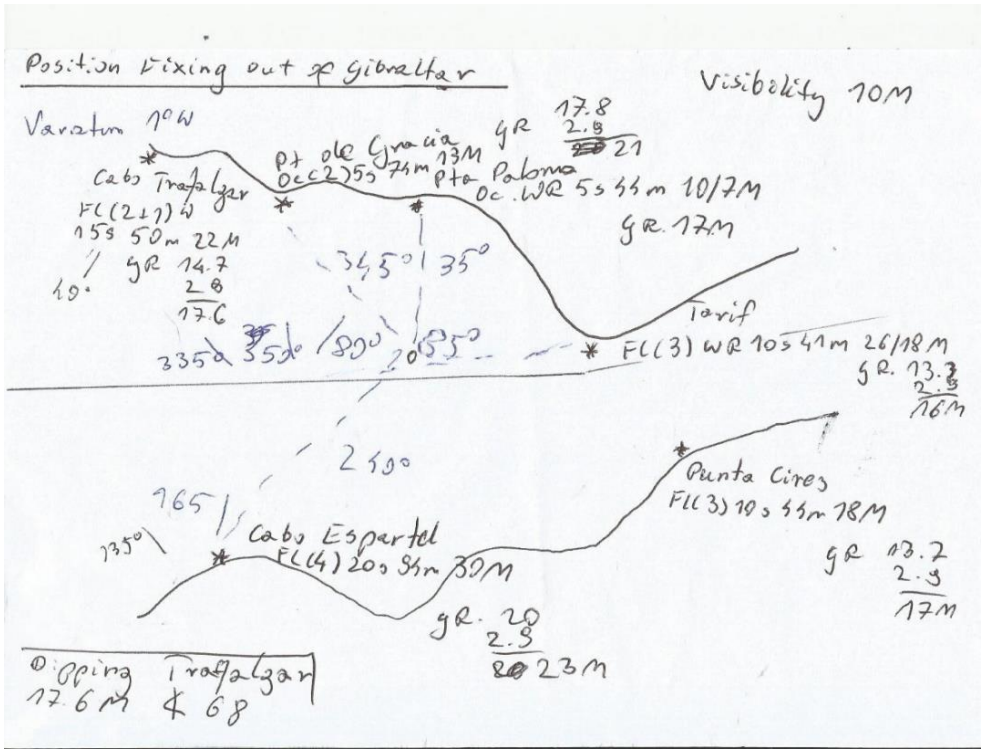
Key lights and navigational marks

Mark name	Type of mark	Light sequence	To port or starboard	Notes
Tarifa	Lt.	Fl(3)WR. 10s 41m 12M	Port	Standing on Isla de Tarifa
Tarifa approach	Lt.	Fl.R.5s 12m 5M	Port	
Harbour head	Lt.	Fl.G.5s 11m 5M	starboard	
- / . -	Lt.	Fl(2)R 7s 7m 1M	Port	
Breakwater	Lt.	Q(3)10s	Starboard	Sitting on e outer breakwater.



Position fixing out of Gibraltar Strait

Terrestrial navigation was used from Marina Gibraltar to Tarifa Point. From Tarifa onward 3-point fixes to lighthouses on the Morocco and Spanish coasts were taken every 2 hours until 5am the next day, when the last position fix was taken based on bearing and distance from dipping Trafalgar lighthouse. From that point onwards, the dead reckoning was started.



Position fixing used out of Gibraltar Strait within sight of land

Pilotage Plan Proforma

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Harbour name: Marina Santa Cruz

Date: 31.10.2021 / 01.11.2021

VHF channels: CH 12 Santa Cruz Harbour Control (<5 miles range), CH09 for marina berthing instr.

Tidal Standard Port: Santa Cruz de Tenerife

Tidal Secondary Port details: .....

	Time	Height m	Direction (Set)	Rate
31.10 High water	19:33	1.6	-	-
Low water	16:51	0	-	-
High water	23:02	1.6	-	-
Low water	05:02	0	-	-
01.10 ~~HW~~	11:14	1.7	LW 17:29	0.2 m

Approach way point / Navigational aid: 1.7 28° 27.2 N 016° 14.5 W

Shelter: Good once inside the main harbour. Entrance exposed to SE.

Type of berth: Pontoon

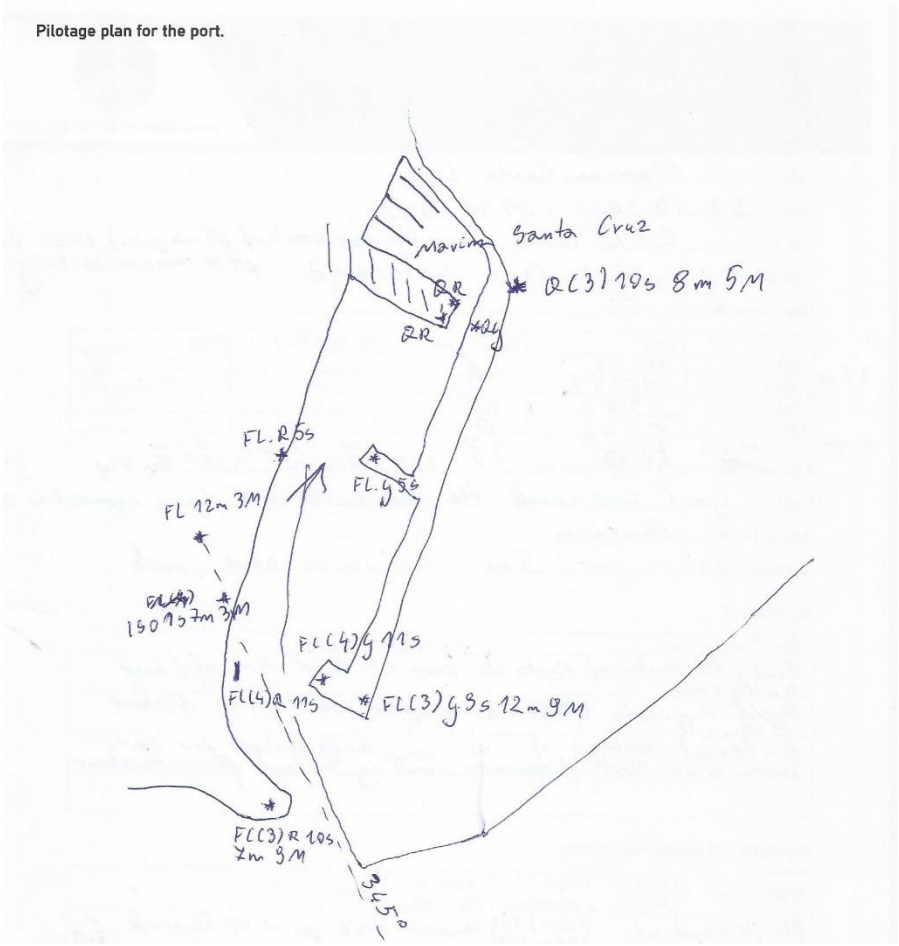
Minimum under keel clearance: 5m Nature of seabed: stone, rock

Key hazards

Name/ description	Avoidance strategy
Rocky Peninsula of Punta de Antequera	Keep at least 1M offshore
Rocky Peninsula of Punta de Roquete	Keep at least 1M offshore
Commercial harbour of Santa Cruz North of the marina	Keep sharp lookout for boats manoeuvring in/out of the harbour
Accelaration Zone around NE limits of Tenerife	Reef down before entering this area.

Key lights and navigational marks

Mark name	Type of mark	Light sequence	To port or starboard	Notes
Pta de Roque	Lt.	Fl(4+1) 30s 246m 21M	Starboard	NE point of Tenerife
Marina Santa Cruz head	Lt.	Fl(3) G 9s 12m 9M	Starboard	harbour head
- " -	Lt.	Fl(3) R 9s 7m 3M	Port	- " -
Marina Santa Cruz Inner harbour	Lt.	Q.R	Port	Inner harbour head
- " -	Lt.	Q.G	Starboard	- " -



Tides in Marina Santa Cruz de Tenerife can generally be skipped for the purpose of keeping enough under keel clearance since the minimal depth in the marina is 5m.

Position fixing into Santa Cruz de Tenerife

Once Tenerife Island was in sight the celestial navigation was continued until possible and until enough land structures were visible to use terrestrial navigation.

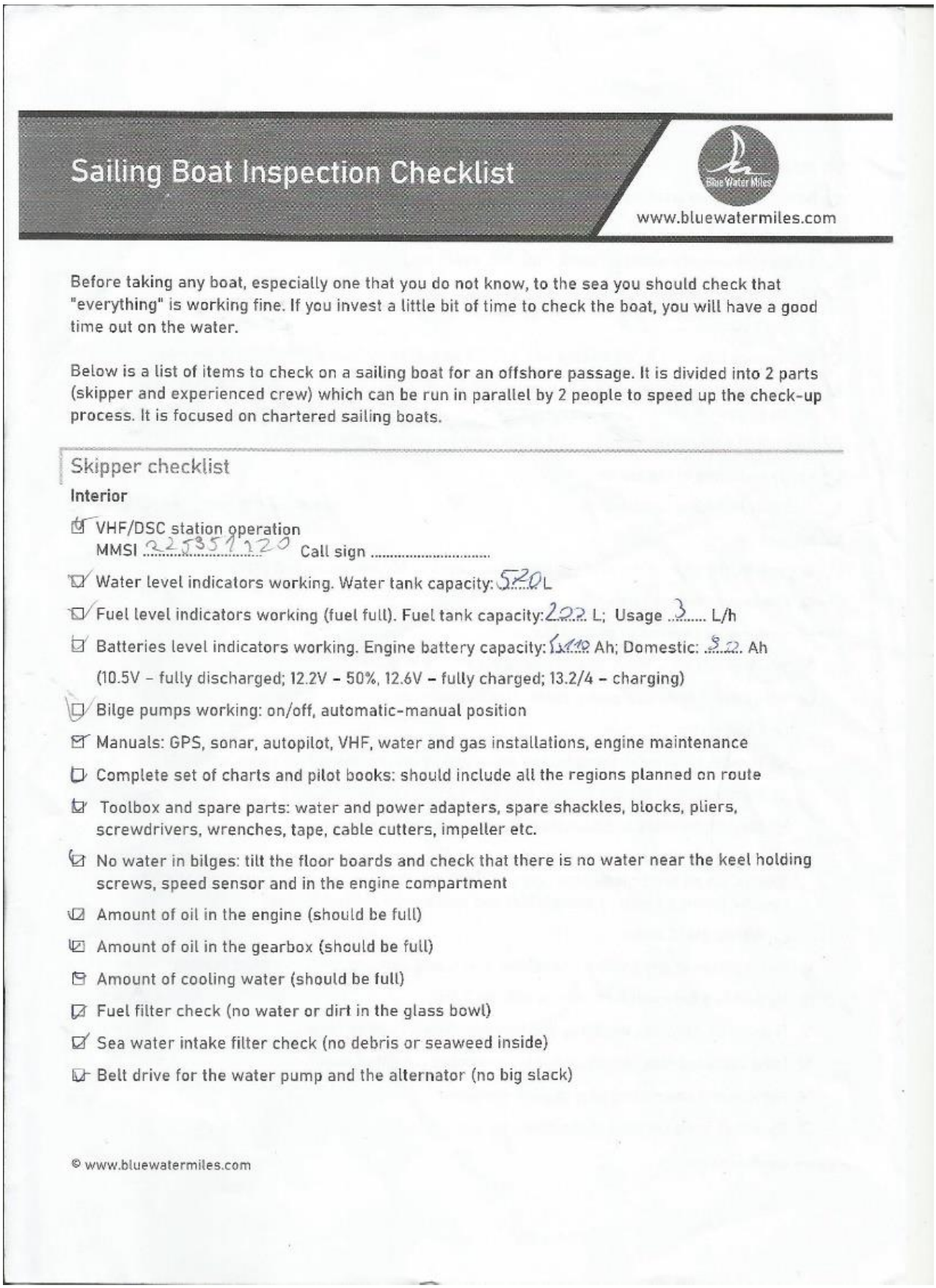
The first land structures identified was El Teide peak (3717m), next mountains at the NE tip of Tenerife and finally Punta de Roque Lighthouse (Grey tower, white building and lantern, 247m high). The lighthouse was useful for position fixing using:

- Bearing and distance from vertical sextant angle
- Bearing and depth contour

Once behind the NE tip of Tenerife, the Santa Cruz city was clearly visible and the rest of the pilotage was carried out using navigational marks.

Boat Inspection

A detailed inspection of the boat was carried before departure. A few issues were found and fixed before slipping the lines: replaced broken snap shackle on guard rails gate, replaced chafed left jib sheet, replaced GPS unit in AIS transmitter, fixed some lockers latches.



Sailing Boat Inspection Checklist

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Before taking any boat, especially one that you do not know, to the sea you should check that "everything" is working fine. If you invest a little bit of time to check the boat, you will have a good time out on the water.

Below is a list of items to check on a sailing boat for an offshore passage. It is divided into 2 parts (skipper and experienced crew) which can be run in parallel by 2 people to speed up the check-up process. It is focused on chartered sailing boats.

Skipper checklist

Interior

- ☑ VHF/DSC station operation
  MMSI 225351120 Call sign .....
- ☑ Water level indicators working. Water tank capacity: 520 L
- ☑ Fuel level indicators working (fuel full). Fuel tank capacity: 222 L; Usage 3 L/h
- ☑ Batteries level indicators working. Engine battery capacity: 1x110 Ah; Domestic: 522 Ah
  (10.5V – fully discharged; 12.2V – 50%, 12.6V – fully charged; 13.2/4 – charging)
- ☑ Bilge pumps working: on/off, automatic-manual position
- ☑ Manuals: GPS, sonar, autopilot, VHF, water and gas installations, engine maintenance
- ☑ Complete set of charts and pilot books: should include all the regions planned on route
- ☑ Toolbox and spare parts: water and power adapters, spare shackles, blocks, pliers, screwdrivers, wrenches, tape, cable cutters, impeller etc.
- ☑ No water in bilges: tilt the floor boards and check that there is no water near the keel holding screws, speed sensor and in the engine compartment
- ☑ Amount of oil in the engine (should be full)
- ☑ Amount of oil in the gearbox (should be full)
- ☑ Amount of cooling water (should be full)
- ☑ Fuel filter check (no water or dirt in the glass bowl)
- ☑ Sea water intake filter check (no debris or seaweed inside)
- ☑ Belt drive for the water pump and the alternator (no big slack)

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On deck/lockers

- [x] Navigation lights working: stern, bow, masthead, deck
- [x] Autopilot working: on/off, ruder indicator
- [x] 3 data instruments working: wind, COG, log, depth etc.
- [x] GPS with chartplotter working (if installed outside)
- [ ] Engine hours: ..... .h
- [x] Emergency tiller: try it. Try to also use it while sailing to make sure it works underway
- [x] Gas bottles: securely stowed, full (pressure / weight), how to close/open and install spare bottle, hoses in good order ~~22+45+(2x20)~~ 22+20+20=62
- [x] Spare fuel canister(s) ~~20~~ ..... L: refill at the nearest petrol station if empty
- [x] Verify fastening of the anchor chain
- [x] Jackstay including lashings fix pin on buckles
- [x] Inspect rigging:

  In general, the aluminium profiles should be checked for corrosion and cracks.

  - [x] Check no pins are open
  - [x] Cotter pins covered to protect the sails
  - [x] Verify clevis pins, bolts, shackles and cleats are in place
  - [x] Verify there is no corrosion, dents, cracks and wear on:
    - [x] Chainplates
    - [x] Turnbuckles: clean threads, can be turned by normal force (not corroded)
    - [x] Terminals and fittings (swage fittings, Norseman, Sta-Lok, etc.)
    - [x] Shroud, forestay and backstay fittings (no strands broken)
    - [x] Mast base (On a painted aluminum mast, corrosion is indicated by bubbles around the fittings. On an unpainted mast, corrosion is indicated by heavy concentrations of white powder (some powder is acceptable) and pockmarks around fittings)
    - [ ] Welds: mast, boom
  - [x] Chain plates aligned with turnbuckles, stays, and shrouds, and no sign of leaking
  - [x] No bending between T-terminals and the T-bars
  - [x] Tension on shrouds, backstay and forestay (should not be loose)
  - [x] Mast centered side to side and with some rake (aft tilt of mast)
  - [x] Furlers and connecting pins in good condition
  - [x] Spreader ends secured to the shrouds

Items that can be checked by experienced crew

Interior

- ☑ Number of bed sheets ~~and towels~~ (if included) 8 TOTAL (PILLOWS + COVER) / 4 SHEETS
- ☑ Condition of mattresses and pillows (whether they are wet / moldy / ripped) GOOD
- ☑ Number of life jackets (equal to or greater than the number of crew members) 7 (5 W/ WHISTLE)
- ☑ Number of safety harnesses unless the life jackets are inflatable 6 × HARNESS W/ TETHER
- ☑ Number of tethers
- ☑ Fire extinguishers on date, fire blanket 2× AFT STBD/PORT POWDER EXP? COCKPIT
- ☑ 230V electric sockets working: plug-in a device
- ☑ USB and 12V sockets working: plug-in a device
- ☑ All lights inside working: navigation, saloon, cabins etc.
- ☑ Glasses / plates / cutlery: check if there is enough for the crew 10 × MUGS (PORCELAIN) 6 MUGS (GLASS)
  1 × GLASS BOWL 15 × GLASSES
  8 × M PLATE 2 × GLASS OSH
  12 × L PLATE 4 × MIXING BOWL
  10 × S PLATE 1 × KETTLE
  2 × CAFETIERE
  ASSORTED UTENSILS 1 × THERMOS
  CUTLERY 1 × WATER JUG
  2 × SAUCEPAN 2 × FRYING PAN
- ☑ Frying pan, kettle
- ☑ Stove and oven working (turn on/off) OVEN?
- ☑ Cooker swing freely on its gimbals
- ☑ Pots and pans can be clamped securely on the cooker
- ☑ Hot water running HOT?
- ☑ Fridge working, clean and odorless
- ☑ Heads working: pump the water several times
- ☑ Shower outlet pump(s) working (flush button)
- ☑ Lifering / Lifesling and Dan buoy at the stern
- ☑ Flares: number depending on requirements (country, area of operation category)

  FLARES
  1 × ORANGE SMOKE
  6 × ROCKET
  3 × HANDHELD
- ☑ First Aid kit ?
- ☑ Navigation instruments: triangles, portland plotter, divider, pencils, rubber
- ☑ Binocular
- ☑ Fog horn and whistle MAIN? EMERGENCY ✓

  H.B. COMPASS ✓
  DIVIDERS ✓
  PARALLEL RULE ✓
  PROTRACTOR ✓
  PENCILS ✓
  ERASER ✓

On deck/lockers

- ☑ Bucket (ideally stout that you can also use as a drogue for emergency steering)
- ☑ Manual bilge pump working (pump handle available)
- ☑ Water hose with at least two yacht length and fittings SHORT W/ SHORE FITTING/ NO NOZZLE
- ☑ Aft shower works ?

Second Fridge ? No
is it working. Only as
locker? pantry?

- [x] Mooring lines (at least three: 2 x aft and 1 x bow)
  How much and what length: 2 x AFT
- [x] Pair of oars for a dinghy
- [x] Spare anchor STBD COCKPIT
- [ ] ~~Net for children (if sailing with children)~~
- [x] Short lengths of lines (e.g. for securing reefing cringles and reefing points) STBD COCKPIT
- [x] Number and condition of fenders (are they inflated)
  How much: 6 (normal) 1 (dan/bulb)
- [x] Topsides (above water hull sides), bow and stern condition: no chips and scratches (make pictures if any exists and make a remark: MISSING LETTERS "BENETEAU")
- [ ] Stanchions, pulpit and pushpit firmly attached and stable PULPIT ?
- [ ] Guard and toe/hand rails not loose
- [ ] Boat keys work with companionway hatches
- [x] Hatches not broken
- [x] Boat hook
- [x] Bathing ladder
- [x] Dinghy with pair of oar locks, without water and air leaks: inflate dinghy and try it on water with outboard motor
- [x] Windscreen and Bimini sun shade: can be set up and closed

When you think that something is not right, and the representative of the shipowner "waves his hand" to it, it is worth to make a remark in the yacht check-in form, and additionally photograph the given element for your own peace of mind.

From personal template:
https://bluewatermiles.com/docs/pre-departure-checklist.pdf
https://bluewatermiles.com/docs/boat-inspection-checklist.pdf

Vessel Suitability

CE Design Category: A (wind: over 8 Beaufort, significant wave height: over 4m).
Mission profile: performance cruising.

They year of manufacture is 2012 and she is in good condition. She is a modern cruiser with a good downwind performance characteristic. She is completing the same route every year.

There is no known history of groundings and she is lifted out regularly to check hull, keel and prop. Maintenance of the engine was done a week before the passage: oil changed, diesel and oil filters changed, impeller and alternator belt checked.

Considerations for long range ocean cruising

The boat has keel bolts to hold the keel to the hull so it is not without risks. For sailing across oceans where rock-solid reliability and easy motion in rough seas is needed, encapsulated keel moulded as part of the hull or traditional integrated long keel would be preferable. Long keels also give a boat great directional stability, which makes them ideal for windvane self-steering. In addition, the rudder should be fully protected with a skeg and the hull thick enough to sustain a collision with submerged objects (e.g. container, whale).

Sail Plan

There are 5 sails on board:

- Mainsail (40m^2) battened with 3 reefs
- Genua on furler (42m^2)
- Storm jib (8m^2)
- Spare mainsail with 2 reefs (40m^2)
- Spare jib (42m^2)

It will be important to make the best use of the available wind at all times thus preserving fuel since there will not be enough fuel to make the entire passage using engine alone. If embarking on a ocean crossing, there should ideally be more sails on board to be able to sail on all ranges of winds (5-60kt) without engine. For very light winds asymmetric or symmetric spinnaker would be useful but perhaps to be avoided in the areas of tropical squalls. For very strong winds the main should have a deeper 3rd or a 4th reef.

The storm tactics on the boat:

- Sail actively:
    - Up to 30kt – mainsail on 2nd reef, rolled/reefed genua
    - Up to 40kt – mainsail on 3nd reef, storm jib
    - > 40kt – going downwind if there is enough sea room, mainsail on 3nd reef, storm jib
    - > 50kt – going downwind if there is enough sea room, storm jib, mainsail might need to be dropped if too much sail area is still present
    - In extreme condition – running downwind on bare pole, using drogue or towing warps if needed to slow the boat down to avoid pitch poling or broaching
- Heave-to with storm jib in very strong wind if sailing upwind is not possible anymore and there is not enough sea room to sail downwind course
    - It is an option but only if the boat would comfortably heave-to in the given conditions
    - Otherwise motoring but it would only work for limited amount of time

Fire Plan

Fire extinguishers in date and situated in cockpit locker, saloon, in aft and fore cabins. There are also automatic extinguishers for the engine compartment. In addition, a hole for this purpose is also provided.

Gas bottles are in outside locker drained overboard. Gas was turned off when not in use with a valve under cooker. The escape routes are through the fore hatch and up the companionway. If a fire could not be contained then abandoning to the life raft would have to be carried out. Fire alarm is included as part of emergency procedures.

Emergency Procedures

Contained in the linked document to limit the size of this narrative:
https://bluewatermiles.com/docs/emergency-procedures.pdf

Included:

- Man Overboard (MOB)
- Abandoning ship
- Injury
- Fire alarm
- Water alarm
- Hole in the hull
- Porthole/Hatch failure
- Engine failure
- Poor visibility
- Heavy weather
- Lightning
- Rig failure
- Steering failure
- Running aground
- Helicopter evacuation
- Ship rescue
- Encountering orcas

Some procedures (MOB, Abandoning ship, Fire & Water alarms) were discussed with all crew before departure as part of the safety briefing. MOB was practiced on water after exiting the marina and drilled again in the middle of the trip.

First Watch Leader was acquainted with all the procedures before departure.

Safety Briefing

Safety briefing was conducted for all crew by the skipper before departure as per the link:
https://bluewatermiles.com/docs/safety-briefing.pdf

Safety Equipment

- EPIRB, service due February 2022
- 1x PLB, service due August 2027
- AIS personal locator beacon, service due June 2026
- AIS transponder class B both receiving and transmitting
- Electronic emergency torch, service due July 2027
- Liferaft stored in the cockpit locker, service due December 2021
- Seabreak Drogue for emergency steering and storm conditions. Suitable for 36-55ft vessels, with 10mm galvanised chain (3m), braid-on-braid rope and bridle to make up to 4 times boat length
- Lifesling
- Lifering
- Jackstays setup with dyneema 6mm lines to run along the centreline of the boat
- Preventers for main sail
- In-date flare pack: 6x parachute rocket red, 3x red handheld, 1x orange smoke
- Comprehensive First Aid kit
- Grab Bag: https://bluewatermiles.com/docs/grab-bag-checklist-offshore.pdf

- Bilge Pump (automatic and manual)
- Emergency navigational lights
- Powerful torch
- Fitted Radar reflector on mast
- Bosun's chair
- SOLAS and inflatable life jackets with tethers for every crew member
- Storm jib (Gale Sail™), setup over roller furling
- Spare Parts: impellers, engine oil, fan belts, oil and fuel filters, shackles, dyneema lines with different diameters, screws, bolts, pins, snatch blocks, sail repair materials, screws, fiberglass repair kit, emergency plugs, stay afloat emergency sealant, tapes (3M and electrical), winch parts, splicing/sail repair kit (needles, whipping twine, sailmaker palm, sail repair tapes), fittings, lubricants (winch oil and grease, dry silicone), rags, spare hose, bulbs etc.
- Comprehensive toolkit including: sharp knife near steering wheel and mast to cut things loose in emergency, cutting gear in cockpit to cut away rigging, baby sledge and punch to drive out clevis pins, Leatherman, clamps, pliers, screwdrivers, hammer, safety googles & gloves, saw etc.
- Fog horns
- Dinghy (e.g. MOB recovery)
- Ship Captain's MEDICAL Guide
- Sea survival manual

Communication Equipment

- VHF Radio with DSC
- Iridium Go Satellite Hub with unlimited internet minutes and SMS, 170 mins for phone calls
- Laptop and phone that can be connected to the satellite unit via Wi-Fi to source weather forecasts, send emails, SMS and make phone calls
- 2x hand held VHF with GPS
- Emergency waterproof mobile phone
- GEOS services subscription (part of Iridium) for emergency and getting medical advice 24/7.
  In addition, contact via satellite phone could be made to one of Maritime Rescue Coordination Centres

Crew Suitability

7 people on board (including skipper).

Qualifications:

- RYA Yachtmaster Offshore (Sail) - skipper
- RYA Yachtmaster Offshore (Motor)
- 2x RYA Yachtmaster Coastal (Sail)
- 1x Day Skipper (Sail)
- 2x Competent Crew (Sail)
- 6x SRC
- 1x LRC
- 4x SCTW
- 4x First Aid
- 1x RNLI lifeboat station member

Crew had no known medical conditions and none of the crew was on any medications.

All crew members are experienced offshore sailors. The team was sailing together on the boat for one week from Palma de Mallorca to Gibraltar prior to the ocean passage with winds up to 30kt and proved to be suitable to undertake the ocean passage.

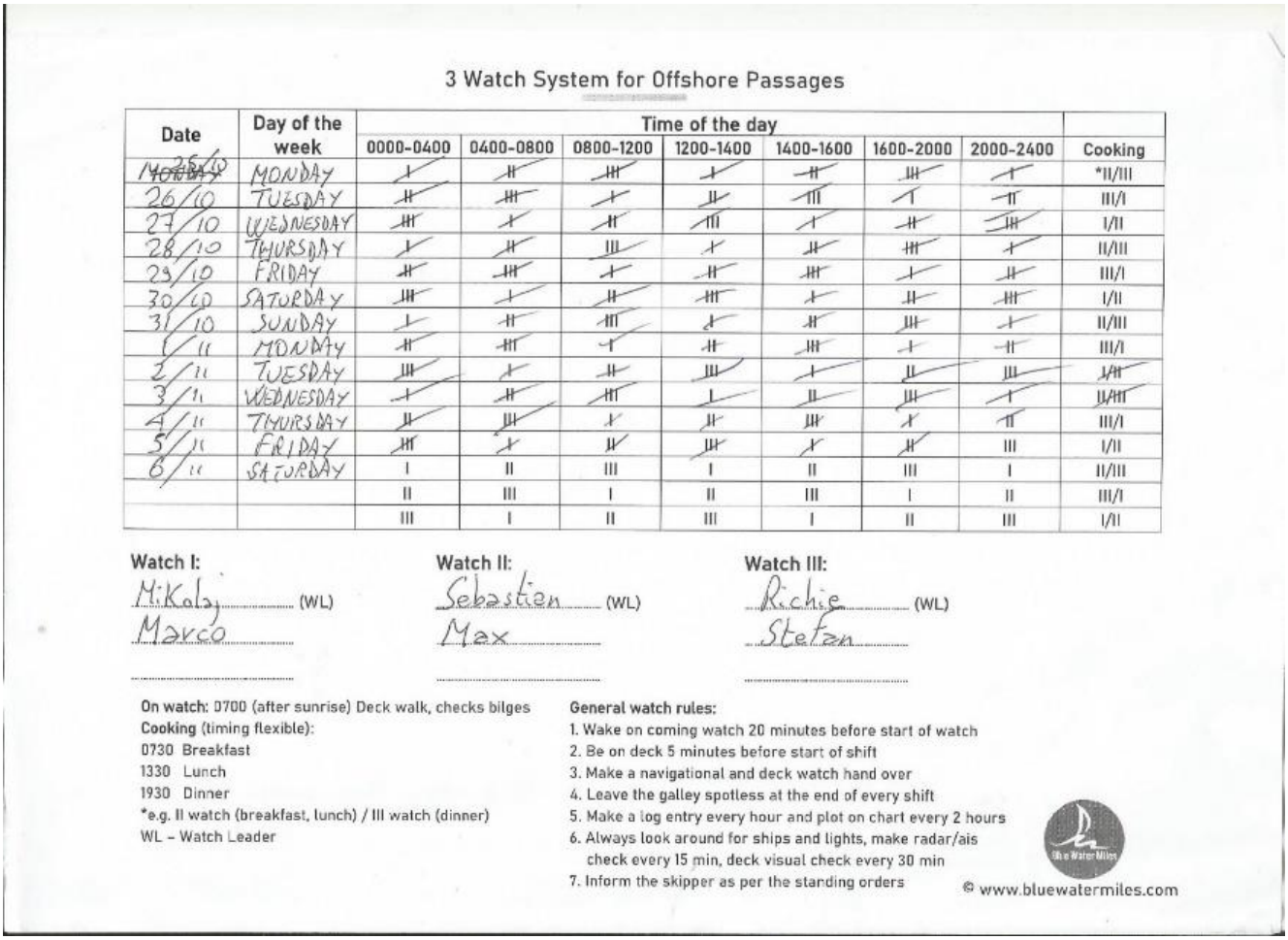
Packaging list provided to the crew by the skipper:
https://bluewatermiles.com/docs/packing-checklist-warm.pdf

Standing Orders

Skipper was not part of the watch rota but the crew was encouraged to wake the skipper whenever the crew was concerned or wanted a second opinion. The circumstances in which the skipper wanted to be alerted were included in the standing orders detailed here:
https://bluewatermiles.com/docs/standing-orders.pdf

Watch System

The following 3 watch system and general watch rules were used during the passage:



3 Watch System for Offshore Passages

Date	Day of the week	Time of the day 0000-0400	0400-0800	0800-1200	1200-1400	1400-1600	1600-2000	2000-2400	Cooking
~~25/10~~ 26/10	~~MONDAY~~ TUESDAY	I	II	III	I	II	III	I	*II/III
26/10	TUESDAY	II	III	I	II	III	I	II	III/I
27/10	WEDNESDAY	III	I	II	III	I	II	III	I/II
28/10	THURSDAY	I	II	III	I	II	III	I	II/III
29/10	FRIDAY	II	III	I	II	III	I	II	III/I
30/10	SATURDAY	III	I	II	III	I	II	III	I/II
31/10	SUNDAY	I	II	III	I	II	III	I	II/III
1/11	MONDAY	II	III	I	II	III	I	II	III/I
2/11	TUESDAY	III	I	II	III	I	II	III	I/II
3/11	WEDNESDAY	I	II	III	I	II	III	I	II/III
4/11	THURSDAY	II	III	I	II	III	I	II	III/I
5/11	FRIDAY	III	I	II	III	I	II	III	I/II
6/11	SATURDAY	I	II	III	I	II	III	I	II/III
		II	III	I	II	III	I	II	III/I
		III	I	II	III	I	II	III	I/II

Watch I: Mikołaj (WL), Marco

Watch II: Sebastien (WL), Max

Watch III: Richie (WL), Stefan

On watch: 0700 (after sunrise) Deck walk, checks bilges
Cooking (timing flexible):
0730 Breakfast
1330 Lunch
1930 Dinner
*e.g. II watch (breakfast, lunch) / III watch (dinner)
WL – Watch Leader

General watch rules:
1. Wake on coming watch 20 minutes before start of watch
2. Be on deck 5 minutes before start of shift
3. Make a navigational and deck watch hand over
4. Leave the galley spotless at the end of every shift
5. Make a log entry every hour and plot on chart every 2 hours
6. Always look around for ships and lights, make radar/ais check every 15 min, deck visual check every 30 min
7. Inform the skipper as per the standing orders

From personal template: https://bluewatermiles.com/docs/watch-systems.pdf

Consumables Management

Details on how consumables were calculated and what considerations were taken can be found below.

All consumables were monitored regularly en route.

Provisioning for the passage

Water

- Expected drinking water usage (highest priority): 3L / day / person. All in bottles to have independent water source in case of tank water issues, e.g. leak, contamination
- Expected water usage for cooking and general washing: 4L / day / person (washing in sea water, finished with fresh water rinse, boiling carbs in sea water)
- Expected water usage for personal hygiene: 1L / day / person
- Expected water usage for showers: 20L / shower / person (1 shower planned for each crew)
- Carry ~20-30% of extra water in case the passage takes more time than estimated
- Watermaker: not carried but would be advisable for ocean crossing as a backup
- If the worst comes to the worst and we do run out of water, collecting rain water from the sails and condensation with sponges and/or heating sea water in pressure cooker to collect evaporated fresh water could be an option
- Different water tap fittings were carried to be able to fill water in destination area

Calculation	
Expected duration: 7.5 days, max: 9 days Drinking water usage: 3L x 7 x 9 = 189L Cooking and washing: 4L x 7 x 9 = 252L Personal hygiene: 1L x 7 x 9 = 63L Showers: 20 x 7 = 140L **Total:** Drinking water: 189L Other: 455L	**Amount of fresh water carried:** • Tanks: 2x 285L = 570L • Bottles (drinking water): 200L In case both water tanks are contaminated or leaked, there will be enough drinking water from bottles for the entire trip.

Food

- Menu plan for the whole trip was prepared and ingredients provisioned based on prepared checklist adjusted according to crew known allergies: https://bluewatermiles.com/docs/provisioning-checklist.pdf
- Food was carried for 9 days with some extra food in cans
- Some fresh food was pre-packed in zip-lock bags and frozen for better preservation
- Vegetables and fruits were stored in netting to be well ventilated
- Packaging was kept off the boat as much as possible, especially cardboard boxes to avoid cockroach eggs
- In case freezer / refrigerator breaks down enough food was carried (tins, bread, sweats) to make safe passage. For ocean crossing, vacuum packing would be advisable to keep the food fresh longer even if the freezer fails

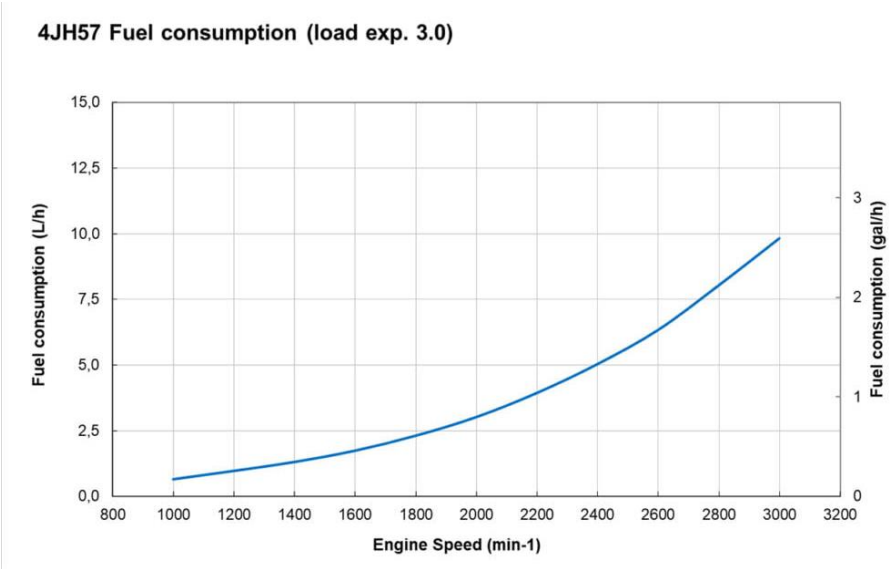
Gas

- 2 gas bottles carried (enough for 14 days). Extra capacity could be used to desalinate sea water if needed
- Expected to use on average 1 cylinder (2.75kg) per week / 7 people
- Enough food was carried in case we run out of gas earlier (tins, sweats, bread, …)
- For circumnavigation it would be a good idea to carry different gas bottle fittings. It can be difficult to get gas bottles replacement en route because there is no standardization for gas bottle fittings

Fuel

- Engine was planned to be used for topping up batteries, getting through calms, getting out of embarkation port, for the final approach into port and emergency situations

Input	Range
Engine: Janmar 4JH57 (57HP), run at 1800RPM, speed 5kt Usage per hour: 2.5L (depending on sea conditions) Fuel capacity: 200L + 100L (5x jerry cans) = 300L	Range with engine only: 600NM Range in days with engine used only to top up batteries (2h / day): 60 days



Source: https://www.yanmar.com/marine/product/engines/4jh45/

Electricity

Capacity & Usage	Engine generation
Domestic batteries capacity: 4x 110Ah (assuming we can only use 30-50%) *The minimum battery capacity should be 3 times the expected consumption. This is because with normal batteries you can only get 30% of the capacity out of them. You should never let lead acid batteries get below 50% of their capacity before you charge it up again as this can limit the lifespan of your battery. As they take a long time to charge up, especially the last 20% or so. Because of this you might find that you are only able to use 30% of the battery's potential, i.e. when it is between 50-80% charged.* Usage: 128Ah/day (see detailed calculations below)	Alternator: 80Ah Engine should be run for 2-3h per day to top up batteries. This has also been confirmed during 1 week of sailing on the boat before the actual passage. The boat did not have alternative power generation system. However, it would be advisable to have one for ocean crossing (discussed in details later).

Formulas:

$$Power\ [W] = \text{Amps}\ [A] * Voltage\ [\text{V}]$$

$$Amps\ [A] = \frac{\text{Power [W]}}{\text{Voltage [V]}}$$

$$Usage\ [Ah] = \frac{\text{Power [W]}}{\text{Voltage [V]}} * h$$

Consumption (12V system):

Item	Power [W]	Time used		Daily consumption	
		Passage [h]	Anchor [h]	Passage [Ah]	Anchor [Ah]
Navigation lights	12	12	-	12	-
Anchor light	4	-	12	-	4
Interior lights	18	4	4	6	6
Chart light	3	10	-	2.5	-
Chart plotter	24	12	12	24	24
GPS	2.4	24	12	4.8	2.4
Instruments (e.g. wind)	4.8	24	-	9.6	-
Depth Sounder	6	24	-	12	-
VHF radio (tx)	25	0.1	0.1	0.2	0.2
VHF radio (rx)	3	24	24	6	6
AIS	2.52	24	-	5.04	-
Autopilot	24 (light to moderate wind)	4	-	8	-
Bilge pump	60	-	-	-	-
Water pump	120	0.25	0.25	2.5	2.5
Windlass	100	-	-	-	-
Refrigerator with Freezer	12	24	24	28.8	28.8
Small laptop for receiving weather forecast etc.	45	1	1	3,75	3,75
Sat nav (Iridium Go)	6-18	1	1	1.5	1.5
Charging phones / mp3 etc.	3-7	2	2	1.2	1.2
Total				128	80
Notes:					

Windlass is skipped as it will only be used when the motor is running so it won't be directly using all amps out of the battery.

Significant savings can be achieved if the boat is hand or wind vane steered (without autopilot). However, an autopilot or wind vane would be a must for short-handed sailing. The radar was not fitted but it would be very useful in areas of greater shipping activity, during reduced visibility and during the night in areas of tropical squalls.

The Fridge power consumption is perhaps a little low for running, but probably about right for a 24hr period. The little compressor types use about 5-6A, but it also cycles. It is hard to get the exact amount because there are many variables affecting refrigerator consumption: climate, type and amount of insulation, ventilation of the compressor, how full it is, how many times the door is opened, whether it is top or front opening, temperature set in the unit etc.

The chartplotter was only used for AIS purposes, not for navigation. GPS was running all the time for tracking purposes.

Power generation systems alternatives:

- **Diesel engine:** run for ~2-4h per day to recharge batteries fully (assuming a decent alternator is fitted, e.g. 12V / 80Ah). This requires fuel but it is by far the most efficient power generation method available. Whatever the new, clean power systems available, a good diesel cannot be beaten.
- **Solar panels:** ~60Ah/day - better if a good system to point the panels to the sun is setup, worse if there are a lot of shady spots on the panels. As an example, a 100W panel in full noon sun puts out about 8A at 12V (96W). If the full sun was hitting the panel 24-hours a day, the output would be 8A x 24H = 192Ah. Since during a 24-hour day, the panel will only put out full power for a couple of hours, the output will be much less.
- **Wind power generator:** ~80Ah/day - very much a function of the weather pattern. The world's cruising routes tend to be downwind, robbing the generator of some of its power. To put that in context, a boat doing 8 knots dead downwind in 20 knots of true wind would experience an apparent wind of just 12 knots. A turbine might generate 200 watts in 20 knots but most manage only 40 watts in 12 knots of wind. For example, if one is heading to the UK from Germany and plan on beating into 20 knots of wind or more every day, a much better output can be generated than sailing downwind from Canaries to Caribbean. The wind turbine would be very useful once in the Caribbean though.
- **Hydro generator:** ~10Ah/h (at 5kt boat speed) - provided one have sufficient boat speed that can keep the batteries topped up without resorting to running the engine at all. With that one can get energy during the night, cloudy days and even when going downwind. Perfect renewable energy kit.
- **Portable power generator:** they are very reliable but this would increase fuel consumption considerably over a long passage.

What if power generation system fails?

Based on the expected power consumption, we should be able to sail for 5-6 days when autopilot, chart plotter and other optional equipment is turned off. The refrigerator has the biggest consumption and if not used, one should be able to sail for many weeks. For ocean crossing it would be advisable to have at least one alternative power generation system. Although people crossed oceans in the past without any power generation systems, it would not be a very pleasant trip.

Rubbish

Best practices that employed:

- Store rubbish in double bags to avoid spillage in lockers
- Crush bottles and cans as much as possible before throwing them away
- Rinse all disposable food containers before putting into bin
- Remove all packaging before anything comes on board
- Throw food scraps overboard when over 12 miles offshore in deep water (as per MARPOL convention)
- Discard trash bags in designated harbour facilities

Paperwork Required

During the trip the boat will stay within EU so no special paperwork is required. Extra visit to immigration and police is not required in the embarkation and disembarkation harbours.

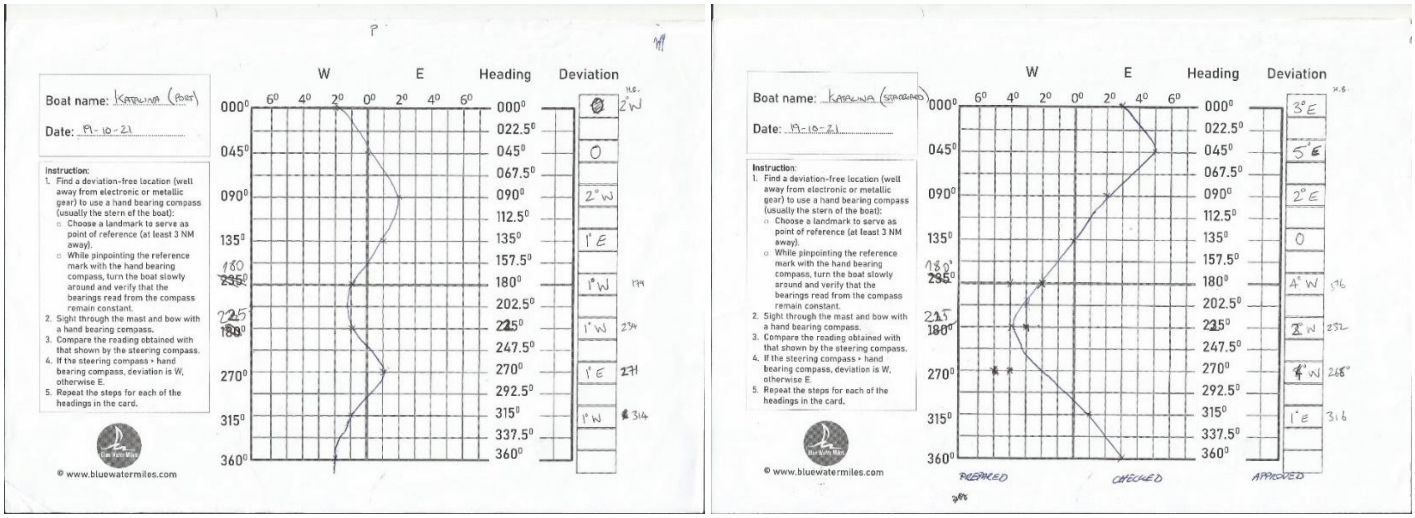
Ship documentation & passports were collected before departure in case of routine coastguard check and clearance.

Navigational Equipment

- Plotting instruments, calculator, digital watch (loosing 1 second per month)
- Binocular with compass
- Hand bearing compass
- Silva compasses
- Astra III Professional Metal Sextant
- Plotting sheets and proformas
- GPS with chartplotter (used for AIS and tracking purposes, and as a backup)
- Spare USB GPS

Charts and Publications

- World Cruising Routes, 2018
- Admiralty Pilot Charts Pub. 106: https://msi.nga.mil/Publications/APC
- Reeds Nautical Almanac 2020 – tidal curves and pilotage info
- Tide forecast for Gibraltar and Tenerife for the sailing period printed from www.tide-forecast.com
- Pilot Books:
    - Imray Atlantic Spain and Portugal, Cabo Ortegal (Galicia) to Gibraltar, 2019
    - Imray Atlantic Islands, Bermuda, Azores, Madeira Group, Canary Islands and Cape Verde, 2016
    - Imray North Africa, 2010
- Charts:
    - Offshore chart: Imray C20 Strait of Gibraltar to Archipélago dos Açores & Islas Canarias
    - Coastal chart: Imray M11 Gibraltar to Cabo de Gata and Morocco (including plans for Gibraltar and Strait of Gibraltar)
    - Coastal chart: Imray E2 Islas Canarias (including plans for Marina Santa Cruz de Tenerife)
    - Coastal chart: NV Atlas Atlantic ATL 3 C17
    - Coastal chart: Imray E3 Arquipélago da Madeira
- Celestial Navigation tables printed and kept in electronic form (https://thenauticalalmanac.com/):
    - Nautical Almanac 2021
    - Pub. No. 249 Vol 1 Sight Reduction Tables for Air Navigation (Selected Starts)
    - Pub. No. 249 Vol 2 Sight Reduction Tables for Air Navigation (Lat 0°-40°)
- Symbols and Abbreviations Used on Admiralty Charts (NP5011)
- Deviation cards: created for port and starboard compasses before the passage



From personal template: https://bluewatermiles.com/docs/deviation-card.pdf

Cleaning and securing the vessel at the end of the passage

The boat was berthed astern in the marina with 2 stern lines and a mooring line tied off on the bow.

The deck and interior were properly cleaned including bilge and engine compartment. Some cushions were ventilated and dried outside to get rid of accumulated moisture.

Trash bags were discarded in designated harbour facilities.

Check-out was carried out to make sure the boat is returned perfectly seaworthy and ready for the next trip.

All seawater valves were closed before leaving the boat in the marina for longer period.

Navigation Routine

The complete berth to berth passage was executed using traditional methods of navigation (without use of GPS). Out of sight of land dead reckoning and celestial navigation was used to fix positions.

The boat time was kept to Spain local time (GMT+2) during the entire passage to make the navigation simple. Since the passage was more south than west bound keeping the same time as we cross meridians did not have any significant effect on the life on board.

The logbook was filled hourly, the DR position established every 2 hours and plotted on the passage chart. DR positions and celestial fixes were logged in the logbook and plotted on the passage chart. All course changes together with times and log readings were logged as well.

		Navigation					The Boat		Weather					
Watch No.	Time	Comp. Course	True Course	Speed	Log	Position Fixing	Sails	Motor	Wind Force	Wind Dir	Sea State	Cloud Cover	Vis.	Baro
	0100													
	0200													

Info logged in logbook
'https://bluewatermiles.com/docs/logbook.pdf

To establish dead reckoning positions the following information's were used:

- Speed/Log from speed sensor
- Compass course
- Deviation: from deviation cards of each compass
- Variation: from the passage chart isogonal lines
- Leeway: estimated depending on the point of sails, wind and sea conditions

Celestial navigation daily routine

1. Morning Star/Planet/Moon sights to get celestial 3-point fix
2. Mid-Morning: Sun sight (+ Moon sight, if visible to get a celestial 2-point fix)
3. Meridian Altitude (Noon) Sun or Sun sight to get 2-point fix
4. Mid-Afternoon Sun sight to get afternoon fix
5. Evening Start/Planet/Moon sights to get celestial 3-point fix

In addition, mix and match with stars, planets, sun and moon for running fix is possible. For example, if only one star sight is taken in the morning twilight and later sun sight, the position line can be transferred to get a fix similar to a sun-run-sun method. One just has to make sure that the sights are in different directions so that position lines are not parallel when plotting them.

What if GPS and sextant is broken or lost?

GPS was carried as a backup if needed. If both GPS and sextant are broken or lost, one could carry on using the dead reckoning and some alternative methods like a stick.

Approximate latitude

The simplest way is to find the right latitude to find us land, then sail across that line of latitude. In other words, keep latitude constant. To do that, all is needed is a stick. Hold it vertically in front of eye with a straight arm and line the top of the stick up with Polaris's star in Northern hemisphere. Then, carefully "nick" the stick at the point where the horizon intersects it. Every evening, check the stick against Polaris. If the "nick" is still on the horizon, you are at the same latitude. For this to be effective, one would have to mark the stick as soon as possible after last reliable fix, use the same stick every time and the same person should do it.

Another method that could be employed is to improvise a quadrant using a protractor and a plastic ruler if we happen to have one. With that we could try to measure celestial objects altitude. The easiest, at least in the northern hemisphere, would be to take the altitude of the Polaris star which is always equal to the observer's latitude (+/- 1o). Another alternative would be to measure the sun at noon but for that we will need a table for declination of the sun to make the calculations.

Approximate longitude

We could establish approximate longitude from local noon (sun at its highest point) by taking a time when it happens and calculating the difference to noon at Greenwich using conversion of Time to Arc (1 hour = 15^{o}, 1min = 15', 4sek = 1'). Applying correction from the graph for the Equation of Time (the difference between what our watch is doing and what the Earth is doing) will make the calculations more accurate.

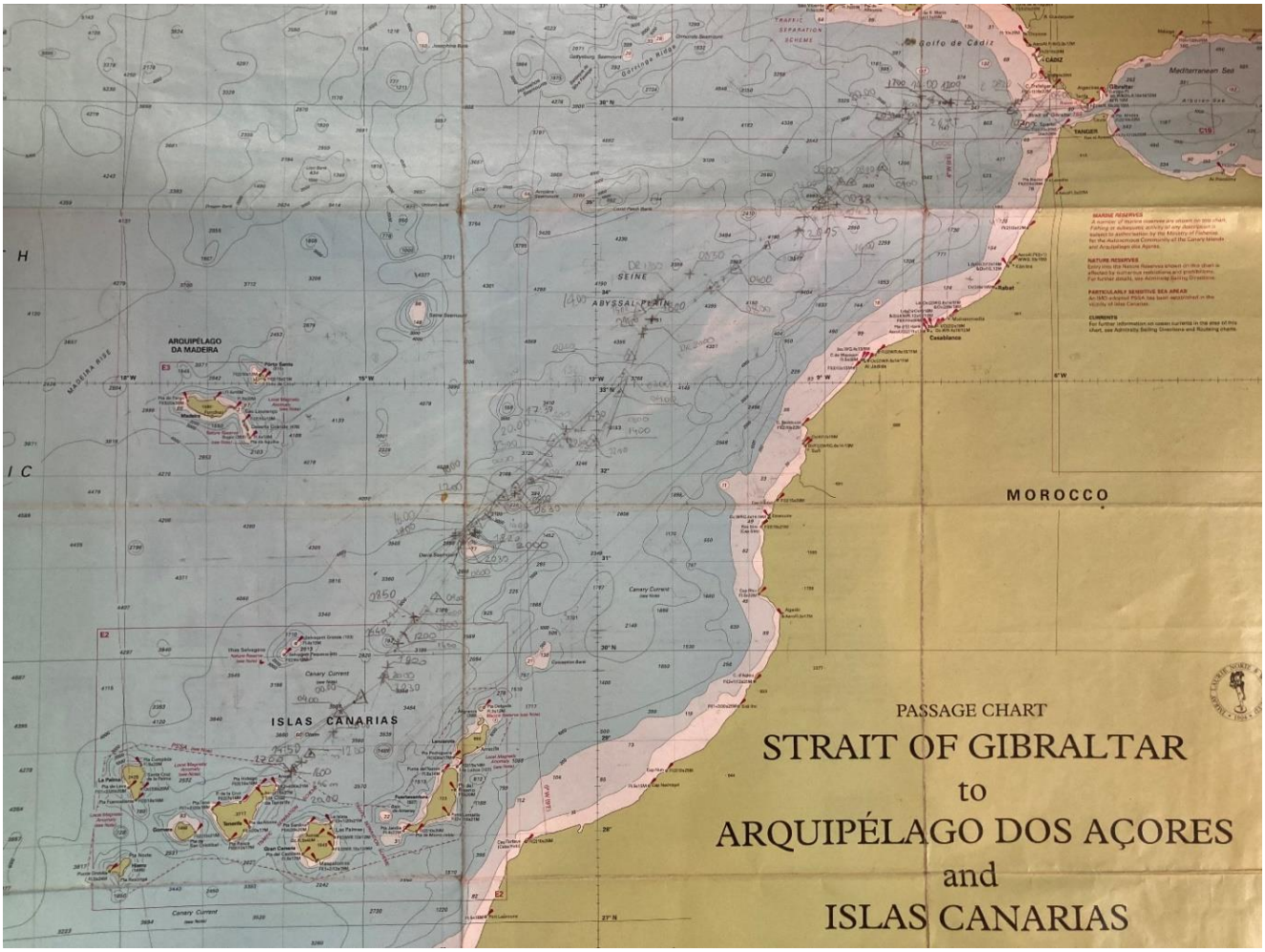
When checking the sun's height against the horizon, it is not possible to look directly at the Sun. Instead, one can use a stick and a bit of paper and mark the end of the shadow every 20 seconds or so as local noon approaches. Alternatively, make a sun shadow board.

These methods will not be terribly accurate because it is very hard to find the exact point in time when the sun is at its highest but it will give us some approximation.

Getting the approximate latitude and longitude using the methods above require an experienced helm steering a constant course and accurate chart keeping to make it work.

Landfall

If a landfall is estimated to be near, looking for seabirds and cumulus cloud formations on the horizon can be very useful. The smaller the bird, the closer land is likely to be, perhaps 30 - 50 miles. But of course, a single bird could always be lost and some birds venture across oceans. Clouds gather over land as the land heats up and convection occurs, causing sea breezes. A good sign! One should listen for VHF radio traffic and watch for other vessels. Asking for the directions for the last miles can always be done. Finally, the top of a 30m (100ft) radio mast will probably be the first landmark to be observed on land. Interestingly enough, it is in the same colours as a safe water mark.



Estimated positions and celestial fixes drawn on the passage chart

25.10.2021 - Exit of Gibraltar (Marina Alcaides)

Charts used: Coastal chart: Imray M11
Pilot Books used: Imray Atlantic Spain and Portugal
Tidal prediction for Gibraltar.

Pilotage details out of Gibraltar and Gibraltar Strait are presented in the "Pilotage" section.

Once the Gibraltar Strait was cleared the compass course of 265° (C), 269 (T) towards the next waypoint should be carried. Due to inconvenient dead run point of sails a few gybes and course changes were needed before reaching the next waypoint ("Cadiz Gulf" at 2300 26.10).

26.10.2021 – Dead Reckoning and Celestial Navigation routine started

Charts used: Imray C20

Dead reckoning was started at 5am on 26.10 when the last position from the dipping and bearing of Trafalgar lighthouse was taken. As predicted, the weather was initially not perfect for celestial navigation as the sky was quite cloudy but it was possible to partially follow the daily routine and regularly establish celestial fix. The sky was clearing as we were progressing towards Canaries.

Estimated positions and celestial fixes drawn on the passage chart (part 1)

The wind conditions during the first 3 days (part 1, 25-28.10) was excellent and a very good progress toward Canaries was made (450NM logged). The swell on the ocean was decreasing as predicted.

Estimated positions and celestial fixes drawn on the passage chart (part 2)

The wind during next days (part 2, 29-30.10) was backing (from W then to SW before coming back to NW), and dropping to 1-2 Beaufort, so we had to use engine for some time to make any significant progress. Based on the Buys Ballot's Law one could conclude that a low formed in the Atlantic and was passing to the north-east of our position. This was also predicted in the synoptic forecast chart on the day of departure. The barometric pressure was almost constant so the low was weak and rather quite far. The visual observations were aligned with the downloaded grib forecasts.

In the last 2 days (part 3, 31-01.10) the wind improved and we were able to sail again without engine.

Estimated positions and celestial fixes drawn on the passage chart (part 3)

01.11.2021 – Approach to Tenerife (Marina Santa Cruz de Tenerife)

Charts used: Imray E2
Pilot Books used: Imray Atlantic Islands

The land was first sighted at on 01.11 at 1035. The celestial navigation was carried until possible and until enough land structures were visible to switch to terrestrial navigation.

Pilotage details to Marina Santa Cruz de Tenerife are presented in the "Pilotage" section.

List of sights taken and celestial fixes obtained during the passage

No	Date	Sights	Fix obtained	Selected for verification*
1	26.10	Morning stars (Sirius, Capella)	2-point fix	
2	26.10	Mid-morning sun		
3	26.10	Noon sun sight	2-point fix	
4	26.10	Mid-afternoon sun	2-point fix	
5	26.10	Evening starts (Kochab) and planets (Venus, Saturn, Jupiter)	4-point fix	
6	27.10	Morning sun		X
7	27.10	Mid-morning sun	2-point fix	X
8	27.10	Noon sun	2-point fix	
9	27.10	Mid-afternoon sun	2-point fix	
10	27.10	Compass check on the sun		X
11	27.10	Compass check on the sun		X
12	27.10	Evening starts (Formalhaut) and planets (Venus, Saturn, Jupiter)	4-point fix	
13	28.10	Mid-morning sun and moon	2-point fix	
14	28.10	Noon sun	2-point fix	
15	28.10	Mid-afternoon sun	2-point fix	
16	28.10	Compass check on the sun		
17	28.10	Evening starts (Altair) and planets (Saturn, Venus)	3-point fix	
18	29.10	Morning starts (Rigel, Sirius, Capella) and moon	4-point fix	
19	29.10	Mid-morning sun		
20	29.10	Noon sun	2-point fix	
21	29.10	Mid-afternoon sun	2-point fix	
22	29.10	Evening planets (Venus, Saturn, Jupiter)	3-point fix	
23	30.10	Morning starts (Sirius) and moon	2-point fix	
24	30.10	Mid-morning sun		X
25	30.10	Noon sun	2-point fix	X
26	30.10	Mid-afternoon sun	2-point fix	X
27	30.10	Evening starts (Altair, Kochab) and planets (Jupiter, Saturn)	4-point fix	
28	31.10	Morning starts (Sirius, Rigel, Capella, Aldebarani)	4-point fix	X
29	31.10	Mid-morning sun		X
30	31.10	Noon sun	2-point fix	X
31	31.10	Mid-afternoon sun	2-point fix	X
32	31.10	Evening stars (Formalhaut) and planets (Venus, Saturn, Jupiter)	4-point fix	X
33	01.10	Morning starts (Rigel, Capella, Aldebarani) and moon	4-point fix	X
34	01.10	Mid-morning sun		
35	01.10	Noon sun	2-point fix	
36	01.10	Mid-afternoon sun	2-point fix	

The log book used on the passage along with all the sights taken will be provided during the exam day. For the verification purposes only relevant pages from the logbook and selected sights are provided.

The number of sights on the open ocean (once cleared well of the coast) could have been reduced since there were no dangers around but the author wanted to practice as much as possible.

Additional corrections of sextant sights for non-standard conditions (temperature, pressure) were not applied as only standard (not abnormal) conditions were encountered.

Celestial Navigation Sights and Plotting

Date 27 oct Day of the week Wednesday From Gibraltar Towards Madeira

Watch No.	Time	Navigation: Comp. Course	True Course	Speed	Log	Position Fix / Notes	The Boat: Sails	Motor	Weather: Wind Force	Wind Dir	Sea State	Cloud Cover	Vis.	Baro
	0000	205	207°	5.6	698.2		J1 m2	\	4/5	NE	3	1	G	1120
	0100	210	213°	4.5	704		J1 M1	–	4	NE	3	1	G	1120
	0120	205	208°	5.3	709.5		J1 m2	–	5	ENE	3	1	G	1120
	0300	205	208°	5.6	715.2		J1 M1	–	5	ENE	3	1	G	1120
	0400	205	208	5.8	721.2	35°21'N 008°18W	J1 m2	–	5	E	3	2	G	1119
	0500	210	213°	6.5	727		J1 M2	–	5	E	3	2	G	1118
	0600	281	275	6.5	734		J1 M2	–	4	E	3	2	G	1119
	0700	275	269	5.5	738		J1 M2	–	4	ENE	3	2	G	1119
	0800	275	269	5.6	744	35°40'N 008°40'W	J1 M2	–	4	ENE	3	2	G	1120
	0900	210	213°	5.8	749.8	35°57.2'N 009°03.8'W	J1 M2	–	4	ENE	3	2	G	1120
	1000	215	216°	4.8	755.2		M2R	–	5	ENE	3	2	G	1121
	1100	215	216°	5.3	761.1		M2R	–	5	ENE	3	2	G	1121
	1200	210p	213°	7.1	768.7	36°57'N 009°02'W	JM	–	5	ENE	3	2	G	1121
	1300	210	213	5.8	772.6	+1242 36°56'N 009°05'W	JM	–	4	ENE	3	1	G	1121
	1400	210	213	5.8	7885	+1430 36°33.2'N 008°51.0'W	JM	–	4	ENE	3	1	G	1119
	1500	270	267	5.2	784		JM	–	4	E	3	1	G	1119
	1600	265	258	6.2	789	36°33'50 N 09°00'00 W	JM	–	4	E	3	1	G	1119
	1700	265	258	5.7	795.6		JM	–	4	E	3	1	G	1119
	1800	180p	183	6.6	804.9	+ 36°42.1'N 009°12.5'W	JM	–	5	NE	3	1	G	1129
	1900	180	183	5.8	8085		JM	–	5	NE	3	1	G	1129
	2000	240	231	5.8	814.6		JM	–	5	NNE	4	1	G	1129
	2100	245	236	5.3	821.4		JM	–	5	NNE	4	1	G	1130
	2200	245	236	6	8284		JM	–	5	NNE	3-4	2	G	1130
	2300	260	251	5.3	8346		JM	–	5	NNE	3-4	2	G	1130

Sailed	Sail hours	Engine hours	Distance [NM]
Today	24	0	123.2
Transferred	26.94	61	1457.266 1.3
Total	118	61	821.4

Deviation from deviation card; Leeway estimated.
Variation: 1°W
Boat time:
Notes (events, weather forecast etc):

Notes

0100 : 210° -1W -1°W +5°LW = 203°
0200 : 205° -1°W - 1°W + 5°LW = 208° * BEST ESTIMATE BUT STRUGGLING TO HOLD STEADY DUE TO WIND

DR @ 0400 : 23nm 209°T
0500 : 210°C -1°C -1°W +5LW =
0600 Gybe (starboard tack)
0900 Gybe (port tack)
1000 215°SD -3°W -1°W -3°W +5°LW = 216°
1200 210°P - 1°W - 1°W + 5°LW = 213°

Log @ Merbs 771.0
15.00 Gybe from 210 to 270
1800 Gybe to 180
2000 Gybe to 240
2100 : 245 -3°W -1°W - 5°LW = 236°
2300 : 260° -3°W -1°W - 5°LW = 251°

758 250 -1W -3°W -5°LW

(6)

Sun Sight

DR1

DR latitude: 35°01'N Chosen Latitude: ~~36°~~ 35° morning
DR longitude: 008°55'W Log reading: 758.2

Month October Day: 27 Local Time: 10:38:38
Zone or longitude to time: -2
Day & U.T. @ Greenwich 27 08:38:38

U.T of sight (hour minute and second) HOUR 08 MINS 38 SECS 38
For the hour of the sight ~~38~~ 08 find: GHA: 304°02.3 and Declination: 12°53.4S
increment MINS 38 SECS 38 + 09° 39.5 d: "d" 08 for MINS 38 : + 0'.5
= G.HA @ time of sight 313°41.8 = Declination @ time of sight 12°53.9S
Chosen longitude (West + East) - 8°41'8
= Local Hour Angle 305°

Enter sight reduction table with Chosen Latitude, whole degrees of Declination & Local Hour Angle to find 'Hc', 'd' and 'Z'.
Then enter table 5 with 'd' and the minutes of declination to find correction to apply to Hc to calculate tabulated altitude.
360/180
"Hc" ~~18°22'~~ 19°54' "Z" 122°
'd' -32 correction -38' "ZN" 122°
54'
Tabulated Altitude ~~18°33'~~ 19°16'

Sextant altitude 18°52.4
+/- index error 0
= Observed Altitude 18°52.4
Height of eye 2.0 Dip - 2.5
= Apparent Altitude 18°49.9
altitude correction + 13.5
= True Altitude 19°03.4
Tabulated Altitude: ~~18°33'~~ 19° 16'
Intercept 12.6 ~~27.6~~
Towards / (Away)
(Tabulated tinier = towards)

North Lat: if LHA > 180 then Za = Z, if LHA < 180 then ZN = 360 - Z
South Lat: if LHA > 180 then ZN = 180 – Z, if LHA < 180 then Za = 180 + Z

(7)

Sun Sight

DR2

DR latitude: 34°54'N Chosen Latitude: 35° Mid-morning
DR longitude: 009°~~58~~ 08'W Log reading: 771.3

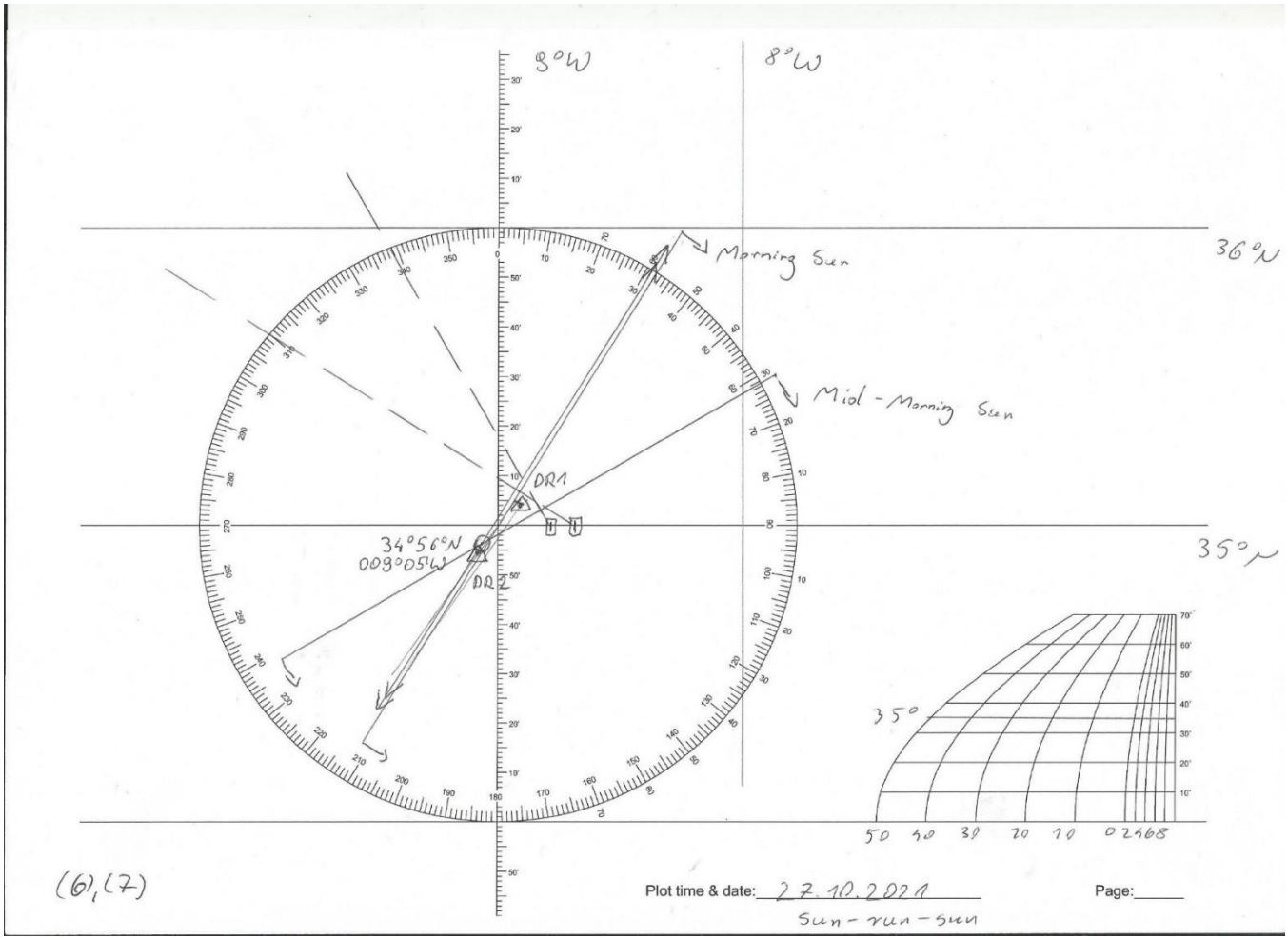
Month October Day: 27 Local Time: 12:42:56
Zone or longitude to time: -2
Day & U.T. @ Greenwich 27 10:42:56

U.T of sight (hour minute and second) HOUR 10 MINS 42 SECS 56
For the hour of the sight HOUR 10 find: GHA: 339°02.4 and Declination: 12°55'.1S
increment MINS 42 SECS 56 + 10°44.0 d: "d" 0.8 for MINS 42 : + 0'.6
= G.HA @ time of sight 349°46'.4 = Declination @ time of sight 12°55'.7S
Chosen longitude (West + East) - 8°46'.4
= Local Hour Angle 336°

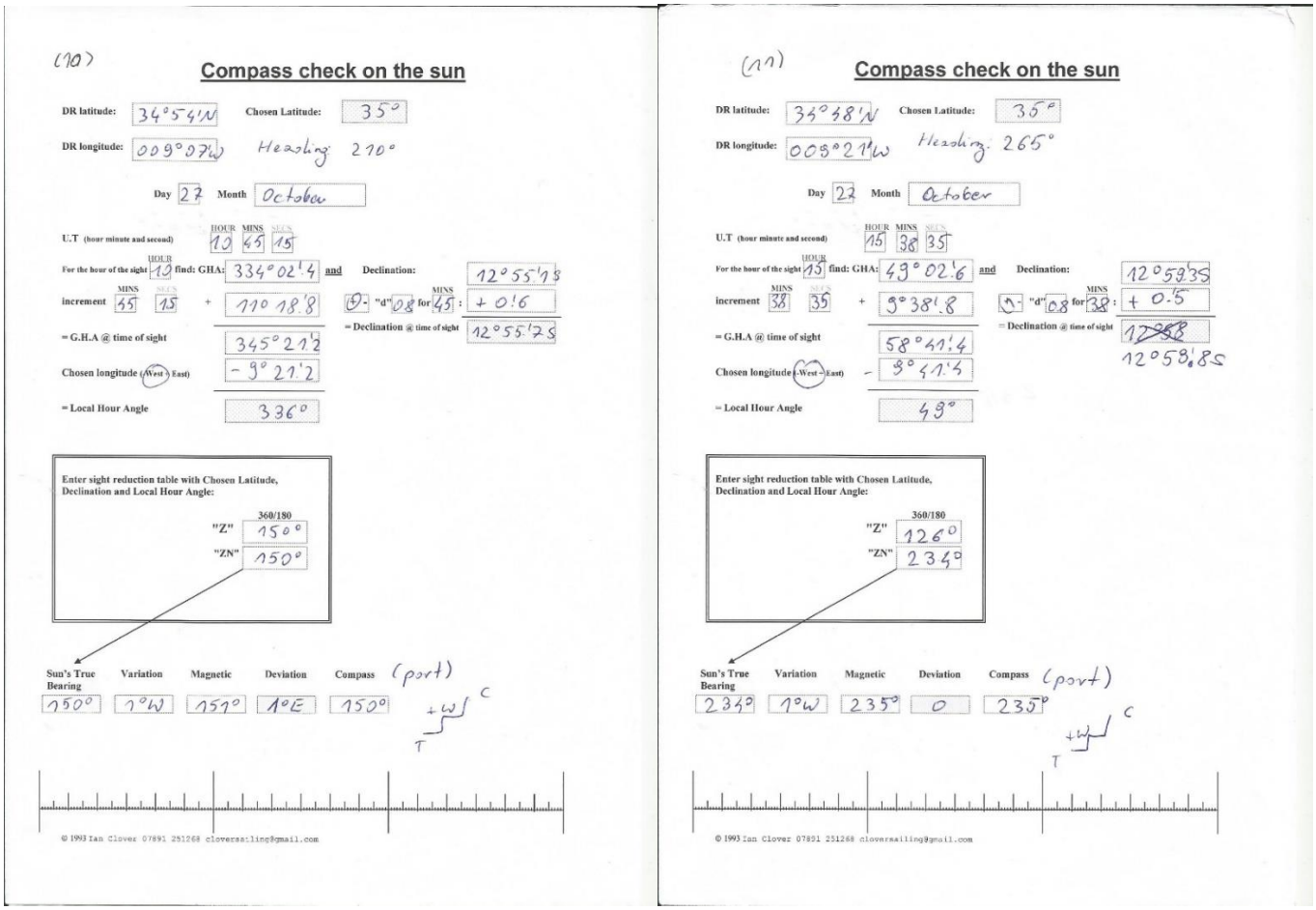
Enter sight reduction table with Chosen Latitude, whole degrees of Declination & Local Hour Angle to find 'Hc', 'd' and 'Z'.
Then enter table 5 with 'd' and the minutes of declination to find correction to apply to Hc to calculate tabulated altitude.
360/180
"Hc" 37°47' "Z" 150°
'd' -54 correction - 50' "ZN" ~~210°~~ 150°
56'
Tabulated Altitude 36°57'

Sextant altitude ~~36°30'.6~~
+/- index error 0
= Observed Altitude 36°40'.6
Height of eye 2.0 Dip - 2'.5
= Apparent Altitude 36°38'.1
altitude correction + 15'.0
= True Altitude 36°53'.1
Tabulated Altitude: 36°57'.0
Intercept 3.9
Towards / (Away)
(Tabulated tinier = towards)

North Lat: if LHA > 180 then Za = Z, if LHA < 180 then ZN = 360 - Z
South Lat: if LHA > 180 then ZN = 180 – Z, if LHA < 180 then Za = 180 + Z



Sights No 10, 11



(10)

Compass check on the sun

DR latitude: 34°54'N Chosen Latitude: 35°

DR longitude: 009°07'W Heading: 270°

Day 27 Month October

U.T (hour minute and second) HOUR 19 MINS 45 SECS 15

For the hour of the sight HOUR 19 find: GHA: 334°02'.4 and Declination: 12°55'.1S

increment MINS 45 SECS 15 + 11° 18'.8 d- "d" .8 for MINS 45 : + 0'.6

= G.H.A @ time of sight 345°21'.2

= Declination @ time of sight 12°55'.7S

Chosen longitude (West) East) - 9°21'.2

= Local Hour Angle 336°

Enter sight reduction table with Chosen Latitude, Declination and Local Hour Angle:

360/180

"Z" 150°

"ZN" 150°

Sun's True Bearing	Variation	Magnetic	Deviation	Compass (port)
150°	7°W	157°	1°E	150°

+W C T

(11)

Compass check on the sun

DR latitude: 34°38'N Chosen Latitude: 35°

DR longitude: 009°21'W Heading: 265°

Day 27 Month October

U.T (hour minute and second) HOUR 15 MINS 38 SECS 35

For the hour of the sight HOUR 15 find: GHA: 49°02'.6 and Declination: 12°59'.3S

increment MINS 38 SECS 35 + 9°38'.8 d- "d" .8 for MINS 38 : + 0'.5

= G.H.A @ time of sight 58°41'.4

= Declination @ time of sight 12°59'.8S

Chosen longitude (West) East) - 9°41'.4

= Local Hour Angle 49°

Enter sight reduction table with Chosen Latitude, Declination and Local Hour Angle:

360/180

"Z" 126°

"ZN" 234°

Sun's True Bearing	Variation	Magnetic	Deviation	Compass (port)
234°	1°W	235°	0	235°

+W C T

Sights No 24, 25, 26

Date 30.10.2021 Day of the week Sat From Gibraltar Towards Tenerife

Watch No.	Time	Navigation: Comp. Course	True Course	Speed	Log	Position Fix / Notes	The Boat: Sails	Motor	Weather: Wind Force	Wind Dir	Sea State	Cloud Cover	Vis.	Baro
	0000	215	207	3.6	1061	Δ 32° 6'N 012° 39'W	M	—	3	W	2	1	G	1132
	0100	235	229	3.3	1065		M	—	3	W	1	1	G	1131
	0120	210	204	2.0	1068		M	1500	2	W	1	1	G	1131
	0300	245	242	5	1073		M	1800	2	WSW	1	2	G	1131
	0400	235	232	4.1	1077	Δ 31° 56'N 012° 50'W	M	1800	2	SW	1	2	G	1131
	0500	245	242	4.3	1083		M	1800	2	SW	1	2	G	1131
	0600	245	242	4.5	1086		M	1800	2	SW	1	2	G	1131
	0700	245	242	4.3	1090		M	1800	2	SW	1	2	G	1130
	0800	245	242	4.3	1095	Δ 32°05'N 013°04'W	M	1800	2	SW	1	2	G	1130
	0900	280	278	3.5	7099	+ 0830 31°49'N 013° 21'W	M	\	2	SW	1	1	G	1130
	1000	180	173	3.3	1102	Δ 31°50' N 013°13' W	M	—	2	SW	1	1	G	1132
	1100	255	251	3	1106		M	-	2	SW	1	1	G	1132
	1200	240	230	4.1	1109	Δ 31° 39' N 013° 18' W	M	1800	2	SW	1	1	G	1133
	1300	240	230	4.0	1113		M	1800	3	SW	2	1	G	1133
	1400	240	230	5.0	1118	DR 31° 39' N Δ 13° 29' W	M	1800	3	SW	2	1	G	1132
	1500	248	238	4.6	1122	+ 1432 31° 30' 5'N 013° 20.0W	M	1800	3	SW	2	1	G	1132
	1600	248	238	4.9	1127	DR 31°26 N Δ 013° 34 W	M	1800	2	SW	2	1	G	1132
	1700	240	230	4.6	1131		M	1800	2	SW	2	1	G	1132
	1800	240	229	4.6	1136	Δ 31° 23' N 013°42' W	M	1800	2	SW	2	1	G	1132
	1900	240	229	4.5	1140	+ 1820 31°29'0N 013°34'.0W	M	1700	2	SW	2	1	G	1132
	2000	240	229	4.1	1145	Δ 31°14' N 013°44' W	M	1700	2	SW	2	1	G	1132
	2100	240	229	4.7	1149	+ 2030 31°18'N 013°49'W	M	1700	2	SW	2	1	G	
	2200	240	229	4.1	1154		M	1700	2	SW	2	1	G	
	2300	210	202	5	1159		M	1700	2	WNW	2	1	G	1134

Sailed	Sail hours	Engine hours	Distance [NM]
Today	5	19	93
Transferred	154	73	1065.5
Total	159	92	1158.5

Deviation from deviation card; Leeway estimated.
Variation: .....
Boat time:
Notes (events, weather forecast etc):

Notes

235°C - 1°W - 2°W - 3°LW = 229°T

0200: ENGINE TURNED ON
20° - 1°W - 2°W - 3°LW = 204°

0240 ALTER COURSE TO STBD HEADING 245°C (Port)
JIB ROLLED

0300: 245 - 0° - 2°W = 243 - 1°LW = 242°

0000 OR corrected as per astro fix at 08.50
0400: 235 - 1°W - 2°W = 232

0840: NOTICED, THAT NAVIGATION LIGHT ON THE BOW (RED) IS NOT WORKING. Fixed by connecting the cable connection

0850 ↑ y, stopped engine. ✗ 280°

280 ± 1° - 2°W = 279° - 1°W = 278

0940 - ENGINE ON, COURSE 225° Compass (port)

1200 LW 8°W

1240 - LOST TOP BATTEN IN MAINSAIL C: 240°

1820 Astro fix 310 22.5'N 043° 35'W
2039 Astro fix 310 18'N 043° 48'0W
2100 - CHANGED COURSE TO 210°C
2145 - ALTERED TO STARBOARD 230C
2200: 210 - 1°W - 2°W - 8°LW
2300: 20 - 1°W - 2°W - 5°LW ⇒ 202°T

DR1

Sun Sight

Morning

DR latitude: 31°42'N Chosen Latitude: 32°

DR longitude: 013°16'W Log reading: 1108

Month: October Day: 30 Local Time: 11:31:19
Zone or longitude to time: - 2
Day & U.T. @ Greenwich: 30 09:31:19

U.T of sight (hour minute and second): HOUR 09 MINS 31 SECS 19

For the hour of the sight HOUR 09 find: GHA: 319°05.4 and Declination: 13°54.0 S

increment MINS 31 SECS 19: + 7°49.8 | "d" 0.8 for MINS 31: + 0.4

= G.H.A @ time of sight: 326°55.2

= Declination @ time of sight: 13°54.4 S

Chosen longitude (-West/+East): - 12°55.2

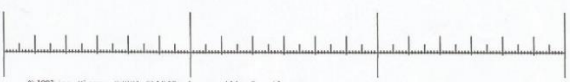
= Local Hour Angle: 314°

Enter sight reduction table with Chosen Latitude, whole degrees of Declination & Local Hour Angle to find 'Hc', 'd' and 'Z'.
Then enter table 5 with 'd' and the minutes of declination to find correction to apply to Hc to calculate tabulated altitude.

"Hc" 27°03' "Z" 128° (360/180)
'd' 44 correction 54' -40' "ZN" 128°
Tabulated Altitude 26°23'

North Lat: if LHA > 180 then Zn = Z, if LHA < 180 then ZN = 360 - Z
South Lat: if LHA > 180 then ZN = 180 - Z, if LHA < 180 then Zn = 180 + Z

Sextant altitude	26°15'.6
+/- index error	0
= Observed Altitude	26°15'.6
Height of eye 2.0 Dip	- 2'.5
= Apparent Altitude	26°13'.1
altitude correction	+ 14'.3
= True Altitude	26°27'.4
Tabulated Altitude:	26°23'
Intercept	4'.4
Towards / Away (Tabulated under = towards)	



(24)

Meridian Altitude (Noon) Sun Sight

Log reading: 1121

D.R. Latitude: 31°30'N DR2

	MONTH	DAY	HOUR	MIN
Time of meridian passage @ Greenwich (Mer Pass)	October	30	11	44
DR longitude: 013° 2.2'W Arc to time: ° 0 52				
+ ' 1 28				
0 53 28 rounded = 0 53 (+west/-east)				
h m s				
= U.T. of meridian passage @ ships E.P (local noon):	DAY 30	HOUR 12	MIN 32	

Declination at the HOUR of meridian passage at ships position will be: 13°56'.4 S

Increment (+/-) 'd' 0.8 for MIN 32 = + 0.5

= Declination at the time of meridian passage at ships E.P: 13°56'.9 S

Sextant altitude	44°19'.8
+/- index error	0
= Observed Altitude	44°19'.8
Height of eye 2.5 Dip	- 2'.5
= Apparent Altitude	44°17'.3
Altitude correction	+ 15'.3
89° 60'.0	
= True Altitude =	44°32'.6
= Zenith distance	45°27'.4
Declination +/-	13°56'.9 *
OBSERVED LATITUDE	31°30'.5 N

*Latitude greater than declination. Same hemisphere: Latitude = Zenith distance + Declination
Latitude less than declination. Same hemisphere: Latitude = Declination – Zenith Distance
Latitude opposite hemisphere to declination: Latitude = Zenith distance - Declination

(25)

DR3 **Sun Sight**

DR latitude: 31° 21'N Chosen Latitude: 31°

DR longitude: 013° 36'W Log reading: 1737

Mid-afternoon sun

Month October Day: 30 Local Time: 18:20:35

Zone or longitude to time: -2

Day & U.T. @ Greenwich 30 16:20:35

U.T of sight (hour minute and second) HOUR 16 MINS 20 SECS 35

For the hour of the sight HOUR 16 find: GHA: 64° 05.6 and Declination: 13° 59.7 S

increment MINS 20 SECS 35 + 5° 08.7 "d" 0.8 for MINS 20 : + 0.3

= G.H.A @ time of sight 69° 14.3 = Declination @ time of sight 14° 00.0 S

Chosen longitude (West = East) 13° 14.3

= Local Hour Angle 56°

Enter sight reduction table with Chosen Latitude, whole degrees of Declination & Local Hour Angle to find 'Hc', 'd' and 'Z'.
Then enter table 5 with 'd' and the minutes of declination to find correction to apply to Hc to calculate tabulated altitude.

"Hc" 19° 54' "Z" 121

'd' -39 correction - 0 "ZN" 239

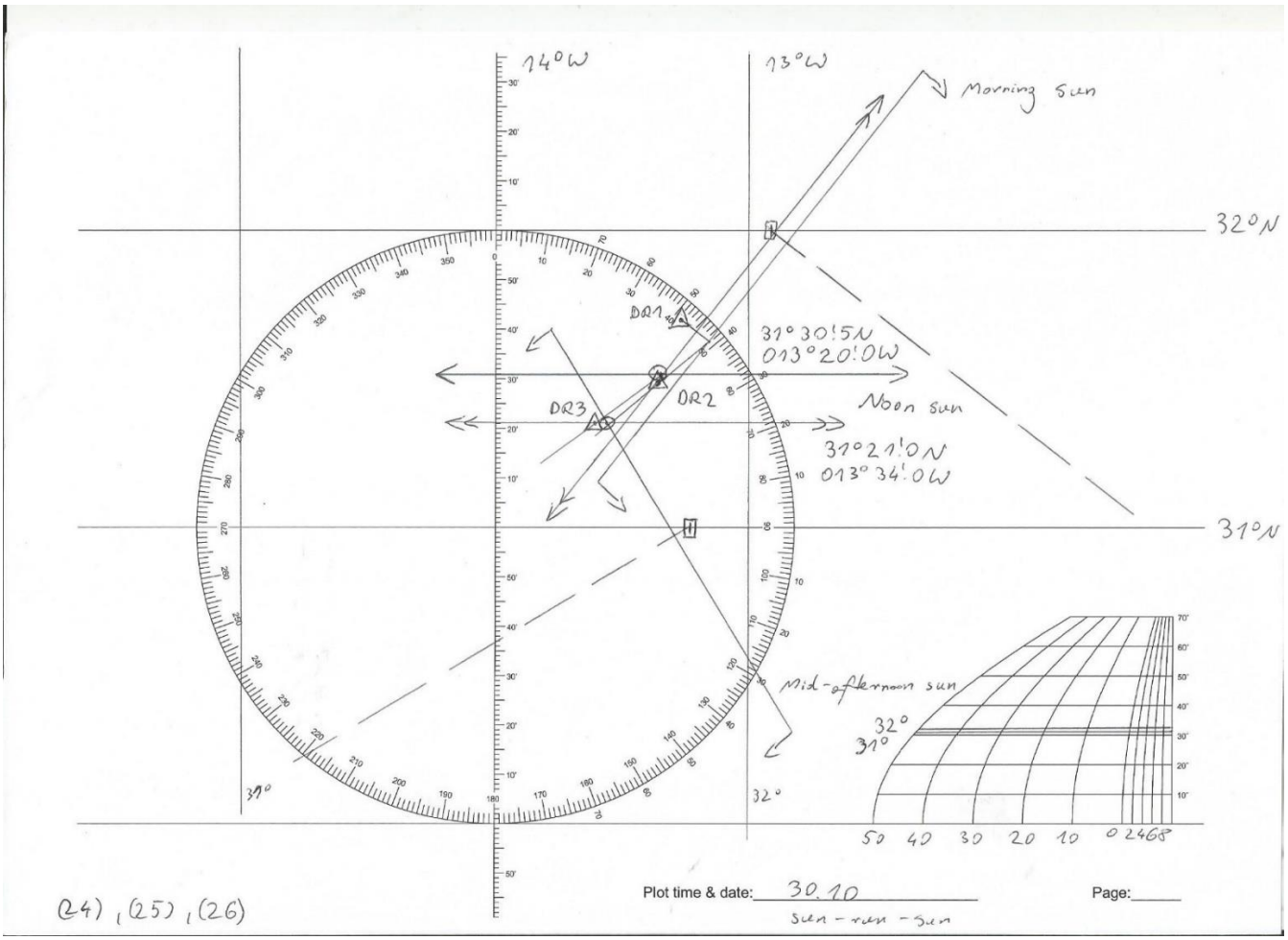
Tabulated Altitude 19° 54'

North Lat: if LHA > 180 then Zn = Z, if LHA < 180 then ZN = 360 - Z
South Lat: if LHA > 180 then ZN = 180 – Z, if LHA < 180 then Zn = 180 + Z

Sextant altitude	19° 46.2
+/- index error	0
= Observed Altitude	19° 46.2
Height of eye 2.0 Dip	- 2.5
= Apparent Altitude	19° 43.7
altitude correction	+ 13.6
= True Altitude	19° 57.3
Tabulated Altitude:	19° 54'
Intercept	3.3

Towards / Away (Tabulated Greater = towards)

(26)



(24), (25), (26)

Sights No 28

Date 31-10-21 Day of the week SUNDAY From GIBRALTAR Towards TENERIFE

Watch No.	Time	Comp. Course	True Course	Speed	Log	Position Fix / Notes	Sails	Motor	Wind Force	Wind Dir	Sea State	Cloud Cover	Vis.	Baro
		Navigation					The Boat		Weather					
	0000	210	202	5	1164	~~[illegible]~~	M	1600	1	W	1	1	G	1135
	0100	215	207	5,5	1170	△ 31°N 013°.50W	JM	1600	2	NW	1	1	G	1135
	0120	215	207	6,0	1176		JM	1600	3	NW	1	1	G	1135
	0300	215	207	6,0	1182		JM	1600	2	NW	1	1	G	1135
	0400	215	207	5,0	1187	DR 30°38' N 014° 08' W	JM	1600	2	NW	1	1	G	1134
	0500	235	227	4.6	1192		M	1600	2	NNW	1	1	G	1134
	0600	235	227	5.0	1198	△ 30° 28' N 014° 19' W	M	1600	2	NNW	1	1	G	1134
	0700	235	233	5.2	1202		M	1600	2	SE	1	1	G	1134
	0800	235	227	4.9	1207	△ 30° 22' N 014° 21' W	M	1600	2	NNE	1	1	G	1134
	0900	215	243	4.3	1212	+0850 30°25'N 014°22'W	M	1600	2	E	1	1	G	1135
	1000	215	213	4.5	1217		M	1600	2	E	1	1	G	1135
	1100	210	208	3,5	1220		M	1600	2	E	1	1	G	1136
	1200	210	208	4.7	1225	DR 30°14'N 014° 30' W	M	1600	2	E	1	1	G	1136
	1300	215	213	5.0	1230		M	1600	3	E	1	1	G	1136
	1400	215	213	5,0	1233	1440 + 30°7.7'N 014° 37'W	M	1600	3	E	1	1	G	1136
	1500 1515	~~210~~	207	4.0										
	1600	210	207	4.1	1237	△ 30° 2' N 014° 38' W	M	1600	1	E	1	1	G	1135
	1700	210	207	4	1241		M	1600	2	E	1	0	G	1135
	1800	210	207	4	1245		M	1600	2	E	1	0	G	1134
	1900	205	202	4.4	1249	+ 1900 29°53'.0N 014°45'.0W	M	1600	2	NE	1	0	G	
	2000	205	202	4	1253	29°47'N 14°46'W DR	M	1600	3	N	2	0	G	1135
	2100	240	237	4,5	1259	+ 2030 29°50'N 014°47'W	M+J	1600	3	ENE	2	0	G	1135
	2200	240	237	4,5	1263		M+J	1600	3	ENE	2	0	G	1135
	2300	230	227	4,5	1268		MJ	1600	2	NNE	2	0	G	1135

Sailed	Sail hours	Engine hours	Distance [NM]
Today	0	24	119.5
Transferred	159	92	1158,5
Total	159	116	1278

Deviation from deviation card; Leeway estimated.
Variation: 3°W
Boat time:
Notes (events, weather forecast etc):

Notes

0230: SWITCH OF NAV LIGHTS FROM „TOP MAST"
TO LIGHTS WITH „STEAM LIGHT"

03:30: A SHIP WITHOUT „AIS" SPOTTED 3NM
FROM US!

04:00: LACK OF WATER IN CURRENT TANK.
INDICATOR SHOWS 1/4 TANK 1
1/4 TANK 2
REPORTED TO MARCIN.

0900: 215 - 2°W - 1°W - 5°LW = 207

0915 - VARIATION IS NOW 3°W, SOON 4°W

1200 - 210 - 1°W - 3°W + 2°LW = 208°

1334 - STOPPED FOR SWIMMING

1500 - TOPPED UP FUEL - GAUGE WAS SHOWING 3/5

1515 - ENGINE ON COURSE 210°C

56.2
52.7
3.5

1700 - 210°C - 1°W (DEV) - 3°W (VAR) + 1° (LW) = 207°T

2000 - PUT UP JIB, ALTERED COURSE 225° COMPASS
DR. DISTANCE 4NM
COURSE 202°T

2030 - NAV LIGHTS ON.

Star-sight plan

DR latitude 30°24' (~30°) DR Longitude ~~14°18'~~ 014°18' (MORNING/EVENING TWILIGHT)

Date @ ships EP: DAY 31 MONTH October

	Sunset/ Nautical Twilight	Civil Twilight	Sunrise/ Nautical Twilight
Time on Greenwich Meridian @ ships latitude:	05:27	05:49	06:14
Longitude to Time: (+West – East) +	0:57	0:57	0:57
U.T @ Ship's E.P:	06:18	06:46	07:11
Period in minutes:	28		25
Halve period:	14		12.5
Available period:	06:32		06:58

Date @ Greenwich:

Arc to time calculation:
° 0 56
' 1 12
0 57 12

For the hour of civil twilight 06 find: GHA aries: ~~131°44.0~~ 129°45.7
increment: MINS 46 + 11°31.9
= G.H.A Aries @ Civil Twilight 141°17.6
Chosen longitude (-West + East) − 14°17.6
= Local Hour Angle 127°

Stars Available:	Hc	Zn
1 Dubhe	49°21'	27°
2 Regulus	60°19'	122°
3 Alphard	48°37'	157°
4 Sirius	37°12'	211°
5 Rigel	30°04'	238°
6 Aldebaran	35°50'	268°
7 Capella	50°02'	307°

06:51:35 36°17.8
~~06:39:03~~ ~~39°50.2~~
06:42:27 ~~30°50~~ 30°38.2
06:44:43 36°14'
~~06:46:52~~ 06:47:46 50°03.8

1 degree = four minutes of time

(28) Moon 06:52:48 56°16'

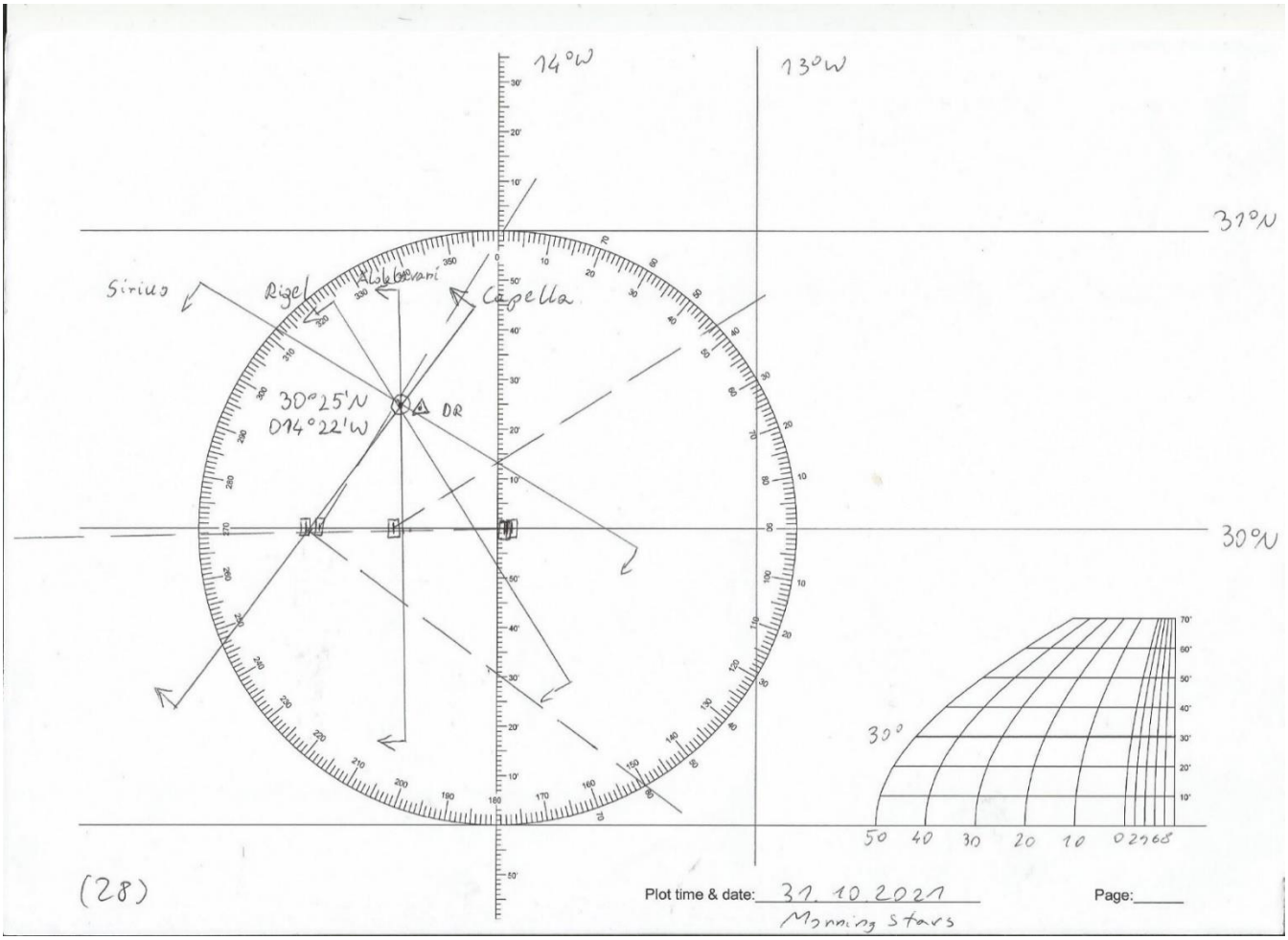
Star-sight reduction

LOG READING:

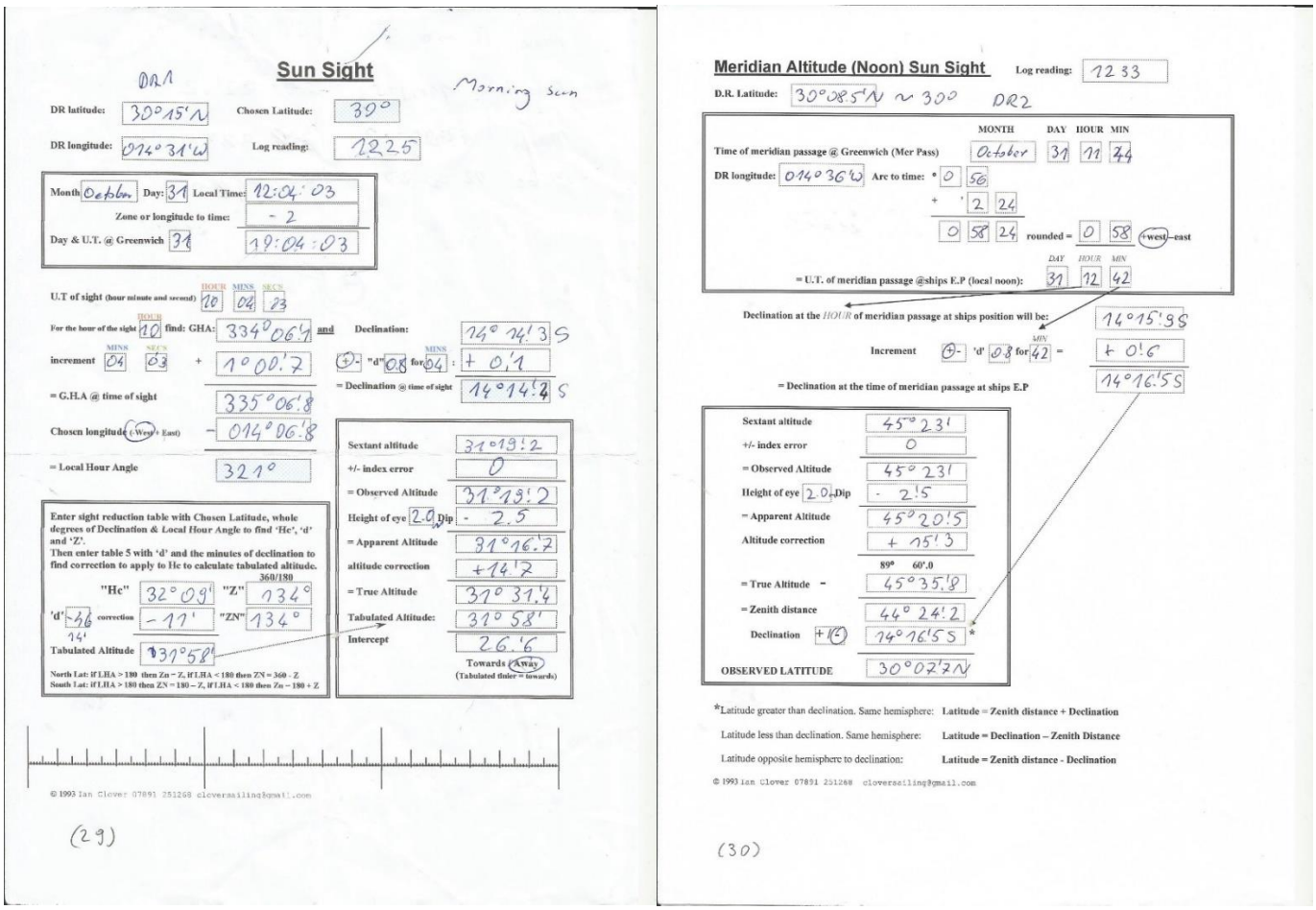
DAY: 31 MONTH: October DR LAT: 30°24.0' (~30°) DR LONG: 014° 18'

Body Observed:	1 Sirius	2 Rigel	3 Aldebaran	4 Capella
U.T. of sight	06 51 35	06 42 27	06 44 43	06 47 46
GHA of Aries (hour of sight)	129°45.7	129°45.7	129°45.7	129°45.7
Increment (minutes and seconds)	+12°55.9	+10°38.5	+11°12.6	+11°58.5
= GHA of Aries @ time of sight	142°41.6	140°24.2	140°58.3	141°44.2
Apply Chosen long: (-West +East)	−14°41.6	−14°24.2	13°58.3	14°44.2
= LHA of Aries ♈	128°	126°	127°	127°
Sextant Alt	36°17.8	30°38.2	36°14.0	50°03.8
Index Error (+off arc/- on arc)	0	0	0	0
= Observed Altitude	36°17.8	30°38.2	36°14.0	50°03.8
Height of eye 2.0 Dip	- 2.5	- 2.5	- 2.5	- 2.5
= Apparent altitude	36°15.3	30°35.7	36°11.5	50°01.3
Altitude correction	−1.3	−1.6	−1.3	−0.8
= True altitude.	36°14.0	30°34.1	36°10.2	50°00.5
Tabulated Altitude (Hc) (from sight reduction tables vol 1) - difference between True and Tabulated gives:	36°44'	30°48'	~~36°~~ 35° 50'	50° ~~00~~ 02'.0
Intercept	30'	13'.9	20'.2	1'.5
Towards / Away (Tabulated tinier towards)	Away	Away	Towards	Away
Tabulated bearing (Zn)	212°	238°	269°	307°

(28)



Sights No 29, 30, 31



Sun Sight

DR3

DR latitude: 29°53'N Chosen Latitude: 30° 18:59:56

DR longitude: 014°45'W Log reading: 1249 130 55'

Month: October Day: 31 Local Time: 18:59:56 mid-afternoon sun

Zone or longitude to time: −2

Day & U.T. @ Greenwich: 31 16:59:56

U.T of sight (hour minute and second): HOUR 16 MINS 59 SECS 56

For the hour of the sight: HOUR 16 find: GHA: 64°06'2 and Declination: 14°19'1S

increment: MINS 53 SECS 56 + 14°59'.0 (N) − "d" 08 for MINS 59: + 0.8

= G.H.A @ time of sight: 78°5'.2 = Declination @ time of sight: 14°18'.9S

Chosen longitude (West + East): −15°5'.2

= Local Hour Angle: 64°

Enter sight reduction table with Chosen Latitude, whole degrees of Declination & Local Hour Angle to find 'Hc', 'd' and 'Z'.
Then enter table 5 with 'd' and the minutes of declination to find correction to apply to Hc to calculate tabulated altitude.

360/180

"Hc" 14°19' "Z" 116°

'd' −35 correction − 12' "ZN" 244°

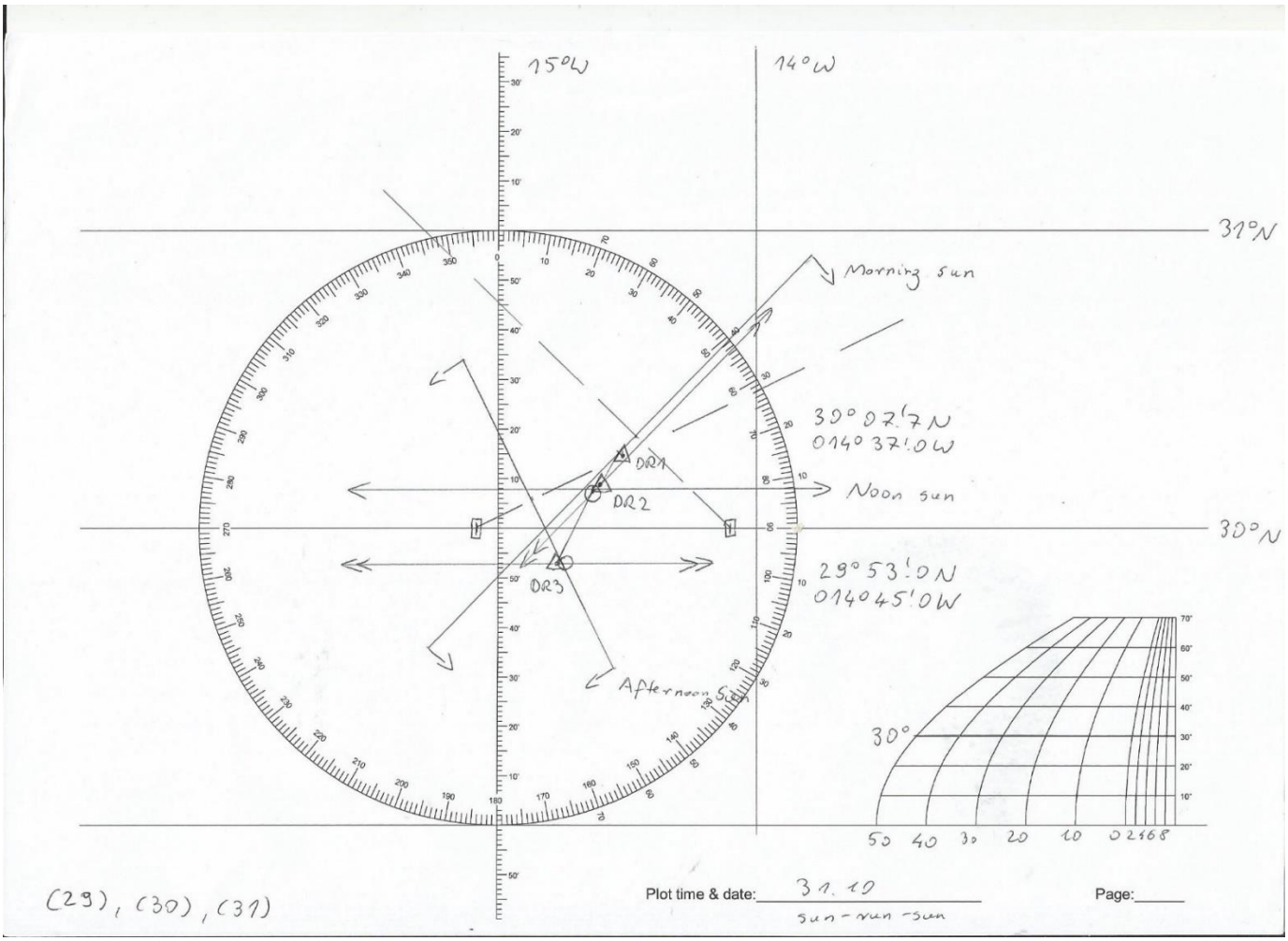
Tabulated Altitude: 14°07'

North Lat: if LHA > 180 then Zn = Z, if LHA < 180 then ZN = 360 - Z
South Lat: if LHA > 180 then ZN = 180 − Z, if LHA < 180 then Zn = 180 + Z

Sextant altitude	13°44'
+/- index error	0
= Observed Altitude	13°44'
Height of eye 2.9 Dip	− 2.5
= Apparent Altitude	13°41.5
altitude correction	+ 12.4
= True Altitude	13°53.9
Tabulated Altitude:	14°07'
Intercept	13.1

Towards / (Away)
(Tabulated time > towards)

(31)



Sights No 32

Star-sight plan

N 30°

DR latitude 29°45'N DR Longitude 14°15'W MORNING/EVENING TWILIGHT

Date @ ships EP DAY	MONTH	Sunset/ Nautical Twilight	Civil Twilight	Sunrise/ Nautical Twilight
31	October			
Time on Greenwich Meridian @ ships latitude:		17:48	17:38	18:06
Longitude to Time: (+West – East)		00:59	00:59	00:59
Date @ Greenwich: 31 October	U.T.@ Ship's E.P:	18:12	18:37	19:05
Period in minutes:		25	28	
Halve period:		12.5	14	
Available period:		18:24	18:51	

Arc to time calculation: ° 0 56 + ' 3 0 = h m s 0 59 0

For the hour of civil twilight 18 find: GHA aries: 310°15'.3

increment: MINS 37 + 9°16'.5

= G.H.A Aries @ Civil Twilight 319°31'.8

Chosen longitude (-West/+ East) − 14°31'.8

= Local Hour Angle 305°

Stars Available:		Hc	Zn
1	Schedar	38°01'	39°
2	Alpheratz	40°48'	76°
3	Fomalhaut	19°29'	144°
4	Altair	67°55'	199°
5	Rasalhague	48°16'	254°
6	Alphecca	28°27'	286°
7	Kochab	30°58'	342°

20:52:28 37°16'.6 ?

20:57:30 22°05'.8

1 degree = four minutes of time

(32)

Jupiter 20:37:09 41°08'.8 Saturn 20:48:04

Venus 20:38:41 21°22'.2 40°56'.8

Planet Finder

Jupiter

DR latitude: 29°45'N Chosen Latitude: 30°N

DR longitude: 014°45'W

	Civil Twilight
Time on Greenwich Meridian @ ships latitude:	17:38
Longitude to Time: (+West – East)	00:58
= Time of Civil Twilight @ ships E.P:	18:32

For the hour of civil twilight HOUR 18 find GHA 344°53'.6 and Declination: 15°01'.4S

increment MINS 32 + 9°15'.0

= G.H.A @ time of civil twilight. 354°08'.6

Chosen longitude (-West/+ East) 15°08'.6

= Local Hour Angle 339°

Enter sight reduction table with Chosen Latitude, Declination and Local Hour Angle: 360/180

"Hc" 40°39' "Z" 153°

"ZN" 153°

Use this form to find an approximate Azimuth (true bearing) and rough altitude for the planet that you want to observe. Do not worry about "v" or "d" corrections. Use only the whole degrees of declination rounded to the nearest degree. At the time of civil twilight sight along the bearing (convert it from true to compass) and the body that does not twinkle at the altitude shown is the planet that you want.

The planets orbit the sun - when they are close to the sun when viewed from the earth they are not available for Astro use. To check their availability refer to the planet notes and planet diagram in the nautical almanac. Beware of confusing planets that are close together – see the notes in the almanac.

(32)

Planet Finder

Saturn

DR latitude: 29°45'N Chosen Latitude: 30°N

DR longitude: 014°45'W

	Civil Twilight
Time on Greenwich Meridian @ ships latitude:	17:38
Longitude to Time: (+West – East)	00:58
= Time of Civil Twilight @ ships E.P:	18:37

For the hour of civil twilight HOUR 18 find GHA 0°23'.9 and Declination: 13°15'.7S

increment MINS 37 + 9°15'.0

= G.H.A @ time of civil twilight. 9°38'.9

Chosen longitude (-West/+ East) 14°38'.9

= Local Hour Angle 355°

Enter sight reduction table with Chosen Latitude, Declination and Local Hour Angle: 360/180

"Hc" 40°46' "Z" 174°

"ZN" 174°

Use this form to find an approximate Azimuth (true bearing) and rough altitude for the planet that you want to observe. Do not worry about "v" or "d" corrections. Use only the whole degrees of declination rounded to the nearest degree. At the time of civil twilight sight along the bearing (convert it from true to compass) and the body that does not twinkle at the altitude shown is the planet that you want.

The planets orbit the sun - when they are close to the sun when viewed from the earth they are not available for Astro use. To check their availability refer to the planet notes and planet diagram in the nautical almanac. Beware of confusing planets that are close together – see the notes in the almanac.

(32)

Planet Finder

Venus

DR latitude: 29°45'N Chosen Latitude: 30°N

DR longitude: 014°45'W

	Civil Twilight
Time on Greenwich Meridian @ ships latitude:	17:38
Longitude to Time: (+West – East)	00:58
= Time of Civil Twilight @ ships E.P:	18:37

For the hour of civil twilight HOUR 18 find GHA 45°21'.4 and Declination: 27°04'.2S

increment MINS 37 + 9°15'.0

= G.H.A @ time of civil twilight. 54°36'.4

Chosen longitude (-West/+ East) 14°36'.4

= Local Hour Angle 40°

Enter sight reduction table with Chosen Latitude, Declination and Local Hour Angle: 360/180

"Hc" 21°27' "Z" 142°

"ZN" 218°

Use this form to find an approximate Azimuth (true bearing) and rough altitude for the planet that you want to observe. Do not worry about "v" or "d" corrections. Use only the whole degrees of declination rounded to the nearest degree. At the time of civil twilight sight along the bearing (convert it from true to compass) and the body that does not twinkle at the altitude shown is the planet that you want.

The planets orbit the sun - when they are close to the sun when viewed from the earth they are not available for Astro use. To check their availability refer to the planet notes and planet diagram in the nautical almanac. Beware of confusing planets that are close together – see the notes in the almanac.

(32)

Star-sight reduction

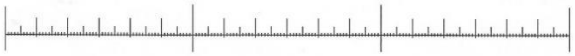
LOG READING: 1249

DAY: 31 MONTH: October DR LAT: 29°45'N DR LONG: 14°45'W

n 30°

Body Observed:	1 Schedar	2 Formalhaut	3	4
U.T. of sight	18 52 28	18 57 30		
GHA of Aries (hour of sight)	310°15.3	310°15.3		
Increment (minutes and seconds)	+ 13°09.2	+ 14°24.9	+	+
= GHA of Aries @ time of sight	323°24.5	324°40.2		
Apply Chosen long: (West -East)	- 14°24.5	- 14°40.2		
= LHA of Aries ♈	309°	310°		
Sextant Alt	37°16.6	22°04.8		
Index Error (+off arc/- on arc)	0	0		
= Observed Altitude	37°16.6	22°04.8		
Height of eye 2.0 Dip	- 2.5	- 2.5	-	-
= Apparent altitude	37°14.1	22°02.3		
Altitude correction	- 1.3	- 2.4		
= True altitude.	37°12.8	21°59.9		
Tabulated Altitude (Hc) (from sight reduction tables vol 1) - difference between True and Tabulated gives:	40°.72	21°55'		
Intercept		4.9		
Towards / Away (Tabulated finier towards)		Towards		
Tabulated bearing (Zn)	39	148°		

X



(32)

Planet Sight

Jupiter

DR latitude: 29°45'N Chosen Latitude: 30°N

DR longitude: 014°45'W Log reading: 1249

Month October Day: 31 Time: 20:37:09

Zone or longitude to time: -2

Day & time @ Greenwich 31 18:37:09

U.T of sight (hour minute and second) HOUR 18 MINS 37 SECS 09

For the hour of the sight 18 find: GHA: 344°53.6 and Declination: 15°01.4 S

increment MINS 37 SECS 09 + 9°17.2 + 0 "d" 0 for MINS 37 : 0

"v" correction 2.4 + 1.5 = Declination @ time of sight 15°01.4S

= G.H.A @ time of sight 354°12.3

Chosen longitude (West + East) - 15°12.3

= Local Hour Angle 339°

Enter sight reduction table with Chosen Latitude, whole degrees of Declination and Local Hour Angle to find 'Hc', 'd' and 'Z'.
Then enter table 5 with "d" and the minutes of declination to find correction to apply to Hc to calculate tabulated altitude.

"Hc" 40°39' "Z" 153°

'd' -54 correction -14' "ZN" 153°

Tabulated Altitude 40°38'

North Lat: if LHA > 180 then Zn = Z, if LHA < 180 then ZN = 360 - Z
South Lat: if LHA > 180 then ZN = 180 – Z, if LHA < 180 then Zn = 180 – Z

Sextant altitude	41°00.8
+/- index error	0
= Observed Altitude	41°00.8
Height of eye 2.0 Dip	- 2.5
=Apparent Altitude	40°58.3
Altitude correction	-1.1
Additional corr:	0
= True Altitude	40°57.2
Tabulated Altitude:	40°38'
Intercept	19.2

Towards / Away (Tabulated finier = towards)

(32)

Planet Sight

Saturn

DR latitude: 29°45'N Chosen Latitude: 30°N

DR longitude: 014°45'W Log reading: 1249

Month October Day: 31 Time: 20:48:04

Zone or longitude to time: -2

Day & time @ Greenwich 31 18:48:04

U.T of sight (hour minute and second) HOUR 18 MINS 48 SECS 04

For the hour of the sight 18 find: GHA: 0°23.9 and Declination: 19°15.1 S

increment MINS 48 SECS 04 + 12°01.0 + 0 "d" 0 for MINS 18 : 0

"v" correction 2.4 + 1.8 = Declination @ time of sight 19°15.1S

= G.H.A @ time of sight 12°26.8

Chosen longitude (West + East) - 14°26.8

= Local Hour Angle 358°

Enter sight reduction table with Chosen Latitude, whole degrees of Declination and Local Hour Angle to find 'Hc', 'd' and 'Z'.
Then enter table 5 with "d" and the minutes of declination to find correction to apply to Hc to calculate tabulated altitude.

"Hc" 40°58' "Z" 177°

'd' -68 correction -15' "ZN" 177°

Tabulated Altitude 40°43'

North Lat: if LHA > 180 then Zn = Z, if LHA < 180 then ZN = 360 - Z
South Lat: if LHA > 180 then ZN = 180 – Z, if LHA < 180 then Zn = 180 + Z

Sextant altitude	40°56.8
+/- index error	0
= Observed Altitude	40°56.8
Height of eye 2.0 Dip	- 2.5
=Apparent Altitude	40°54.3
Altitude correction	-1.1
Additional corr:	0
= True Altitude	40°53.2
Tabulated Altitude:	40°43'
Intercept	10.2

Towards / Away (Tabulated finier = towards)

(32)

Planet Sight

Venus

DR latitude: 29°45'N Chosen Latitude: 30°N

DR longitude: 014°45'W Log reading: 1249

Month October Day: 31 Time: 20:38:41

Zone or longitude to time: -2

Day & time @ Greenwich 31 18:38:41

U.T of sight (hour minute and second) HOUR 18 MINS 38 SECS 41

For the hour of the sight 18 find: GHA: 45°21.4 and Declination: 27°04.2 S

increment MINS 38 SECS 41 + 9°40.2 + 0.2 "d" 0.2 for MINS 38 : +0.1

"v" correction -0.3 - 0.2 = Declination @ time of sight 27°04.3S

= G.H.A @ time of sight 55°01.8

Chosen longitude (West + East) - 15°01.8

= Local Hour Angle 40°

Enter sight reduction table with Chosen Latitude, whole degrees of Declination and Local Hour Angle to find 'Hc', 'd' and 'Z'.
Then enter table 5 with "d" and the minutes of declination to find correction to apply to Hc to calculate tabulated altitude.

"Hc" 21°21' "Z" 142°

'd' -48 correction -3' "ZN" 218°

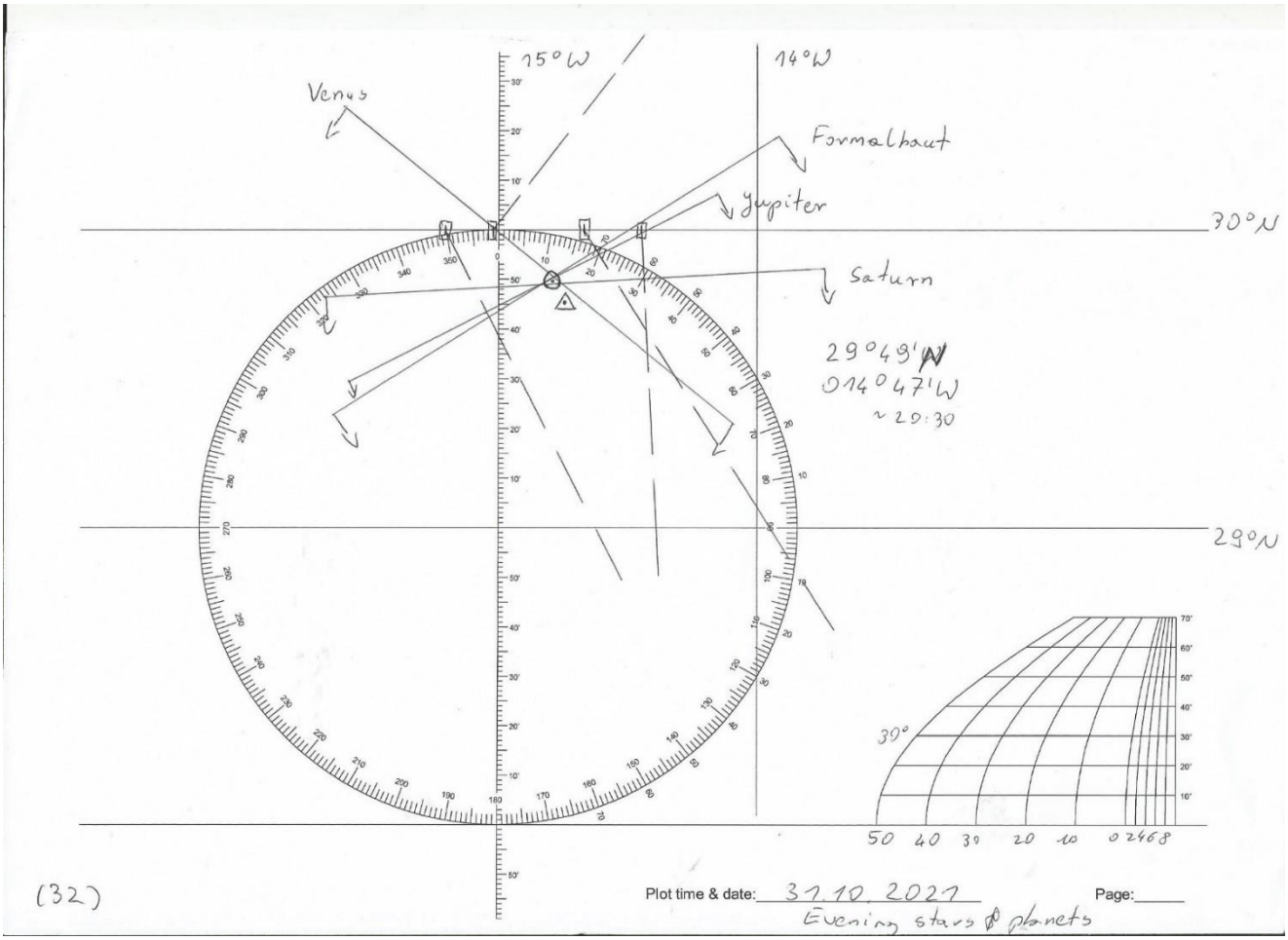
Tabulated Altitude 21°18'

North Lat: if LHA > 180 then Zn = Z, if LHA < 180 then ZN = 360 - Z
South Lat: if LHA > 180 then ZN = 180 – Z, if LHA < 180 then Zn = 180 + Z

Sextant altitude	21°22.2
+/- index error	0
= Observed Altitude	21°22.2
Height of eye 2.0 Dip	- 2.5
=Apparent Altitude	21°19.7
Altitude correction	-2.5
Additional corr:	+0.1
= True Altitude	21°17.3
Tabulated Altitude:	21°18'
Intercept	0.7'

Towards / Away (Tabulated finier = towards)

(32)



Sights No 33

Date 1-11-21 Day of the week MONDAY From GIBRALTAR Towards TENERIFE

Watch No.	Time	Navigation: Comp. Course	True Course	Speed	Log	Position Fix / Notes	The Boat: Sails	Motor	Weather: Wind Force	Wind Dir	Sea State	Cloud Cover	Vis.	Baro
	0000	235	232	4,0	1273	DR 29°31' N 015°09' W	MJ	1600	3	NNE	2	0	G	1136
	0100	250	246°	3.0	1276		MJ	–	3	NNE	2	0	G	1136
	0200	245	238°	4.1	1280		JM	–	4	NNE	2	0	G	1136
	0300	245°	238°	3.6	1284		JM	–	4	NNE	2	0	G	1136
	0400	250°	243°	4.5	1288	DR 29°24' N 015°18' W	JM	–	4	NE	2	0	G	1135
	0500	195°	195°	4.5	1293		JM	–	4	NE	2	1	G	1135
	0600	195°	195°	4	1297		JM	–	4	NE	2	1	G	1134
	0700	200°	200°	4.5	1302		JM	–	4	ENE	2	1	G	1133
	0800	195°	195°	5	1307	DR 29°01' N 015°24' W	JM	–	4	NE	2	1	G	1134
	0900	200°	200°	4	1311	+ 29°08' N 015°23.5' W	JM	–	4	NE	2	2	G	1134
	1000	200°	201°	4	1316		JM	–	3	NE	2	2	G	1134
	1100	225°?	226°	4	1320		JM	1600	3	NE	2	2	G	1134
	1200	225°	226°	5	1326	DR 28°56' N 015°36' W	JM		4	NE	2	2	G	1134
	1300	210°	211°	4.9	1331		JM	1600	3	NE	2	2	G	1134
	1400	240°	234°	4.9	1335	1440 + 28°52.4' N 015°42.1' W	JM	1600	3	NE	2	2	G	1135
	1500	240°	233°	4	1340		JM	1600	3	NNE	2	1	G	1134
	1600	240°	233°	5	1345		JM	1600	3	NE	2	1	G	1134
	1700	240°	203°	5	1350	+ 28°43.5' N 015°51.5' W	JM	1600	3	NE	2	1	G	1133
	1800	225°	208°	5	1355		JM2R	1600	3	NNE	2	1	G	1133
	1900	235°	228°	5	1360		JM2R	1800	3	NNE	2	1	G	1133
	2000	240°	239°	5	1365	Sight 28°28'N DR 016°08' W	JM2R	1800	3	N	2	1	G	1133
	2100					Passage to Santa Cruz de Tenerife 220 NM		1820						
	2200							1820						
	2300													

Sailed	Sail hours	Engine hours	Distance [NM]
Today	10	13	97
Transferred	159	116	1278
Total	169	129	1385

Deviation from deviation card; Leeway estimated.
Variation: .....
Boat time:
Notes (events, weather forecast etc):

Notes

00.00 Engine stop
Boat (probably trawler) in opposite direction, initially without AIS switched on
2 65 - 3 W - 3 -

4 x 10 = 240 + 30 = 270
7°W in 2000 -9°E ANNUALLY = 4°W in 2021
1321 : 189

0440 GYBE TO PORT TACK COURSE 210°C
210°C - 1°W - 4°W + 5°LW = 210°T
DEV VAR

0500 195° - 1°W - 4°W + 5°LW = 195
0800 DR 195°T 24NM
1000 Co(2000) - 3°W - 1°W +5°LW = 201°T
DECK LOG EXECUTED, RIGHT JIB SHEET SLIGHTLY EASED UP.
(TO BE CHANGED ON STARBOARD ~~PORT~~ TACK).
GYBED TO STARBOARD TACK 280°C
1030 GYBED TO PORT TACK, COURSE 225°C
1035 LAND SIGHTED!!!
1050 started engine 1600 RC 225°
225°C - 1°W - 3°W + 5°W = 226
DEV VAR LEE
1145 JIB furled and working
1200 DR corrected as per sun sight 28°55.5N 015°40.4W
1330 CC 210° → 240°
1500 240 - 1°W - 3°W - 3°LW = 233°T
1600 GYBED TO PORT TACK COURSE 210°C
1750 Reef 2 to the Main and redirect 225°C

Star-sight plan

~ 29°

DR latitude 29°04'N DR Longitude 15°32'W (MORNING/EVENING) TWILIGHT

Date @ ships EP DAY	MONTH	Sunset/ Nautical Twilight	Civil Twilight	Sunrise/ Nautical Twilight
01	November			
Time on Greenwich Meridian @ ships latitude:		05:27	05:49	06:14
Longitude to Time: (+West - East)		01:02	01:02	01:02
Date @ Greenwich				
01 Nov	U.T@ Ship's E.P:	06:23	06:51	07:16
Period in minutes:		28	25	
Halve period:		14	12.5	
Available period:		06:37	07:03	

Arc to time calculation: ° 1 0 / ' 2 8 = h m s 01 02 08

For the hour of civil twilight 06 find: GHA aries: 130°44'.5

increment: MINS 51 + 12°47.1

= G.H.A Aries @ Civil Twilight 143°32'

Chosen longitude (-West + East) 15°32'

= Local Hour Angle 128°

Stars Available:	Hc	Zn
1 Dubhe	48°51'	27°
2 Regulus	61°35'	122°
3 Alphard	45°52'	158°
4 Sirius	37°33'	213°
5 Rigel	29°50'	240°
6 Aldebaran	34°58'	271°
7 Capella	48°46'	308°

↓ Local time

08.51.13 29°39.6

08.47.06 35°47'

08.52.52 50°10'6

1 degree = four minutes of time

(33) Moon 09:01.40 44°04'.8

Star-sight reduction

LOG READING:

DAY: 01 MONTH: November DR LAT: 29°04' ~ 29° DR LONG: 15°32'

Body Observed:	1 Rigel	2 Aldebaran	3 Capella	4
U.T. of sight	06 51 19	06 47 06	06 42 52	
GHA of Aries (hour of sight)	130°44'9	130°44'9	130°44'9	
Increment (minutes and seconds)	+ 12°51'3	+ 11°48'4	+ 10°44'8	+
= GHA of Aries @ time of sight	143°36'.8	142°33'.3	141°29'.7	
Apply Chosen long: (-West +East)	-15°36'.8	-15°33'.3	-15°29'.7	
= LHA of Aries ♈	128°	127°	126°	
Sextant Alt	29°39'6	35°47'	50°10'6	
Index Error (+off arc/- on arc)	0	0	0	
= Observed Altitude	29°39'.6	35°47'	50°10'6	
Height of eye 2.0 Dip	- 2'.5	- 2'.5	- 2'.5	-
= Apparent altitude	29°37'1	35°44'.5	50°08'.1	
Altitude correction	-1'7	-1'3	-0'.8	
= True altitude.	29°35'.4	35°43'.2	50°07'.3	
Tabulated Altitude (Hc) (from sight reduction tables vol 1) - difference between True and Tabulated gives: Intercept	29°50'	35°57'	50°06'	
	14'6	7'.8	1'.3	
Towards / Away (Tabulated finier towards)	Away	Away	Towards	
Tabulated bearing (Zn)	240°	270°	308°	

(33)

Moon Sight

DR latitude: 29°04'N Chosen Latitude: 29°

DR longitude: 15°32'W Log reading:

Month November Day: 01 Time: 09:01:40

Zone or longitude to time: -2

Day & time @ Greenwich 01 07:01:40

U.T of sight (hour minute and second) HOUR 07 MINS 01 SECS 40

For the hour of the sight HOUR 07 find: GHA: 332°26'6 and Declination: 08°17'6N

increment MINS 01 SECS 40 + 0°23'9 +(-) "d" 14.5 for MINS 01 : - 0'.4

"v" correction 12'0 + 0'3 = Declination @ time of sight 08°17'2N

= G.H.A @ time of sight 332°50'8

Chosen longitude (-West) East) 15°50'8

= Local Hour Angle 312°

Enter sight reduction table with Chosen Latitude, whole Degrees of Declination & Local Hour Angle to find 'Hc', 'd' and 'Z'

Then enter table 5 with 'd' and the minutes of declination to find correction to apply to Hc to calculate tabulated altitude.

"Hc" 44°33' "Z" 109° (360/180)

'd' 33 correction + 8' "Zn" 109°

817'

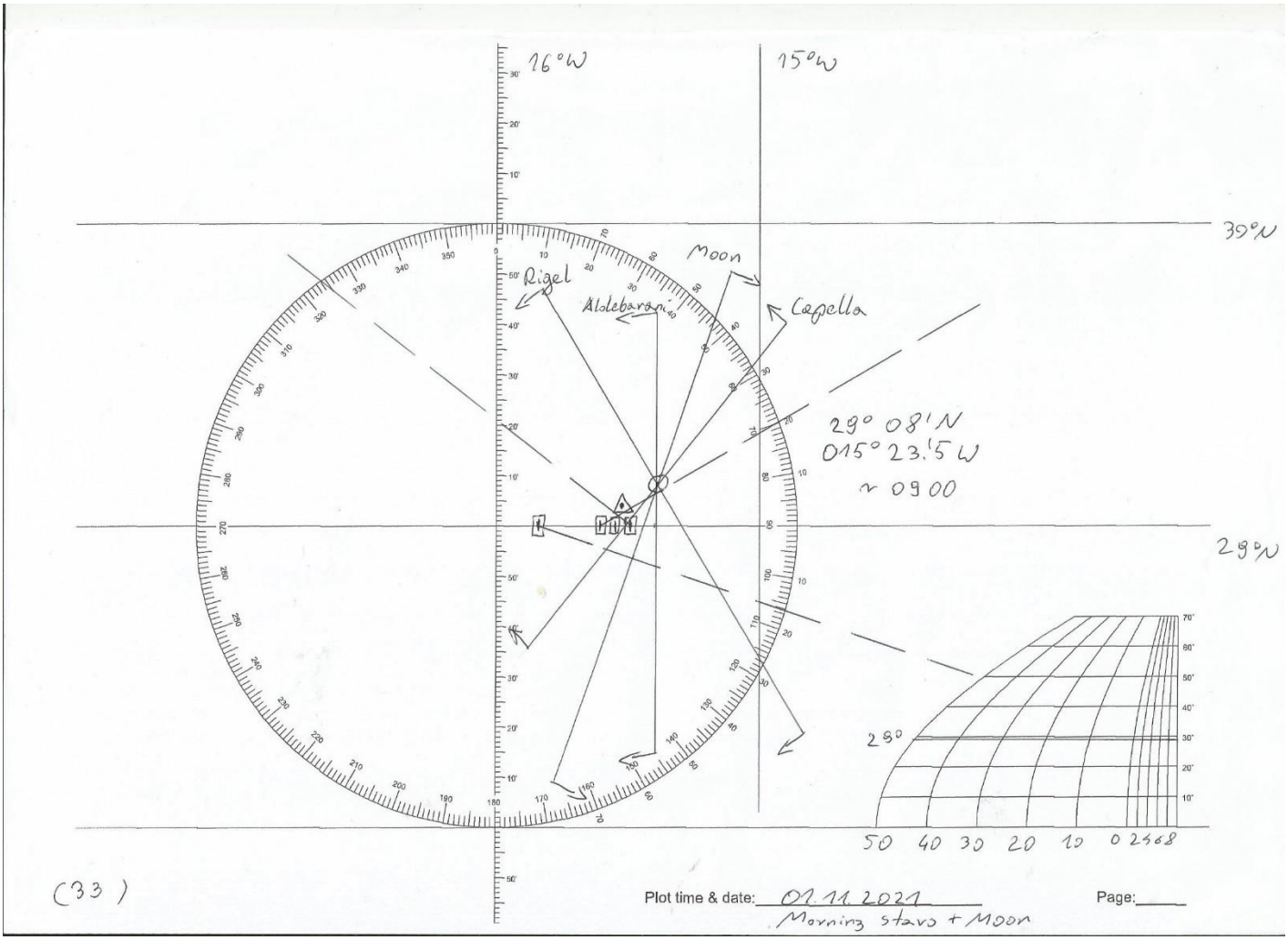
Tabulated Altitude 44°39'

North Lat: if LHA > 180 then Za = Z, if LHA < 180 then ZN = 360 - Z

South Lat: if LHA > 180 then ZN = 180 – Z, if LHA < 180 then Za = 180 + Z

Sextant altitude	44°04'8
+/- index error	0
= Observed Altitude	44°04'8
Height of eye 2.0 Dip	- 2.5
=Apparent Altitude	44°02'3
Altitude correction	+ 51'1
H.P. 58'3 LL	+ 5'5
=True altitude (if Upper Limb subtract 30')	44°58'.9
Tabulated Altitude...	44°33'
Intercept	19'.9
Towards / Away (Tabulated finier = towards)	

(33)



Passage Summary

The passage was successful and all crew returned on land in one piece.

The route was followed as planned. If we had had whisker pole for genoa, we could sail wing on wing reducing the number of gybes and sailing more direct route - such setup would be recommended for transatlantic in trade winds. Also having a gennaker onboard would help make better progress in very light winds. However, a spinnaker should rather be avoided in areas of tropical squalls for trouble free crossing.

As forecasted, strong winds and higher sea states were encountered in the first two days of the passage which helped to make a very good progress at the beginning. We encountered some calms in the second half of the trip and had to motor for a day or so. Nevertheless, we arrived as planned after 7.5 days in Tenerife.

Shipping did not pose any issues during the passage. Some ships passed in the Gibraltar Strait and as predicted only a few ships were sighted on the open ocean (cargo over 50m and fishing).

A few minor issues with the boat were experienced during the passage: not working navigation light on starboard side, clogged water valve for switching tanks, lost last batten on the main sail. However, these were fixed en route and had no influence on the overall passage execution.

The deck reckoning and celestial navigation was very rewarding for everyone. The author managed to teach celestial navigation basics to all crew members. At the end of the passage, we even run a little competition on who will get the best celestial fix.

The weather during the passage was pretty good for celestial navigation but not perfect especially in the first half of the trip which was quite cloudy. Fortunately, we always had some cloud free spots to get reliable sights. In retrospection, the author managed to get most fixes within 1-5NM from the actual position.

Collectively we managed to complete 845NM over 7.5 days, navigating by no means of GPS and the crew all finished the voyage with high moral and happy faces.