VOYAGE (PASSAGE) PLANNING
Introduction

- Passage planning or voyage planning is a procedure of developing a complete description of a vessel's voyage from start to finish.

- Production of a passage plan prior to departure is a legal requirement.

- The practice of voyage planning has evolved from drawing lines on nautical charts to a process of risk management.
What to include?

The plan should include:
- leaving the dock and harbor area,
- the enroute portion of a voyage,
- approaching the destination,
- and mooring.
How to do it?

Passage planning consists of four stages:
- appraisal,
- planning,
- execution,
- and monitoring
Appraisal

The appraisal stage consists of gathering and contemplating all information relevant to the voyage.

By consulting:
- nautical charts,
- nautical publications and
- performing tasks such as
  - weather forecasting,
  - prediction of tides and currents, and
  - checking of local regulations and warnings.
Management Lesson
Never start a project unless all resources are available
Planning

The process involves projecting various future events including landfalls, narrow passages, and course changes expected during the voyage.

The mental model becomes the standard by which later on the navigator measures progress toward the goal.
Planning

The plan should include the following factors:
- the plotting of the intended route on appropriate scale charts
- the main elements to ensure safety of life at sea, safety and efficiency of navigation, and protection of the marine environment during the voyage
  - safe speed,
  - necessary speed alterations en route,
  - minimum clearance required under the keel in critical areas with restricted water depth,
  - course alteration points etc.
Execution

A number of tasks has to be executed during the course of the voyage.

The captain's responsibility is to treat the plan as a "living document" and to review or change it in case of any special circumstances that should arise.
Execution

Factors which should be taken into account when executing the plan, or deciding on any changes of it include:

- the reliability and condition of the vessel's navigational equipment,
- estimated times of arrival at critical points for tide heights and flow,
- meteorological conditions,
- daytime versus night-time passing of danger points, and
- traffic conditions, especially at navigational focal points.
Monitoring

Once the voyage has begun the progress of the vessel along its planned route must be monitored. This requires that the ship's position be determined.
Load Line
Economic aspect

The economic objectives of time and distance saving are to be secondary to safe navigation, and are to be ignored whenever the master assesses it necessary.
Computer aids

- NavTools Route XP
- Global fleet control
- PC-Planner
Deviations

- Results that are different to the planned ones
- Can occur on daily basis
Deviations

It is important to determine their source:
- internal or
- external reasons.

Possible reasons for deviations in maritime transport:
- bad weather conditions,
- delays in ports,
- route deviations (e.g., due to medical condition of crew member),
- fuel price changes,
- hull or engine condition,
- poor planning etc.
WEATHER ROUTEING

The selection of ‘best route’ that accounts for:

- Weather forecasts
- Estimated sea conditions
- Vessel characteristics
Sources of Information

- Pilot Chart Atlases
- Routeing Charts
- Admiralty Sailing Directions
- Ocean Passages for the World
- Monthly Climate Charts
- Weather Forecasts and Synopsis
Simplified Ship Performance Curves

Generally derived from either scale-modelling or from a ship’s logbook data.
Climatic Considerations

- Recommended routes
- Vessel type & condition (loaded/ballast)
- Time of year – anticipated weather
- Probability of gales & fog
- Is vessel ice strengthened?
- Direction & rate of ocean currents.
- Operations to be conducted en-route.
Can be *ship based* or *shore based*.

Services are available under the following general headings (*Types of Routes*):

- **Least Time**
  - Tankers & bulk carriers – cargoes relatively robust. Urgent Cargo delivery
- **Least Damage**
  - Time not a priority- sensitive cargoes. Live animals, towing, etc.
- **Least Time with Least Damage**
  - A compromise, but the main focus is reducing damage.
- **Constant Speed**
  - To comply with charter party stipulations. Port arrival time pre-arranged.
- **Fuel Saving**
  - Generally involves avoiding head seas, market driven, e.g. high bunkers price.
- **Towing**
  - Usually involves advice upon sailing date & time. Special speed and or manoeuvring requirements.
Using a Wave Details Chart
Construction of a Least Time Track

1) Mark destination & GC track on polar stereographic/gnomonic chart.

Plot GC track to Destination
Construction of a Least Time Track

Use wave height forecast for next 12 hour and ship’s performance curves ...to lay-off 12 hour distance at approximately 10° intervals.
Repeat the calculation for 10° intervals & construct time front for next 12 hours.

12 Hour Time Front or Position Locus
Choosing points on the 12 hour time front, construct a time front for the next 24 hours.
The process is repeated for all available 12/24 hour forecasts.
Current Charts

Three main types:
- Current Rose Charts
- Vector Mean Current Charts
- Predominant Current Charts
Current Rose Chart

Legend
6-12 n.mile/d
13-24 n.mile/d
25-48 n.mile/d
49-72 n.mile/d
72 n.mile/d

Within circle, upper figure gives number of observations. Lower figure gives frequency of currents of less than 6 n.mile/d.
Vector Mean Chart

Legend for current speed
1—5 n.mile/d.
6—12 n.mile/d.
13—24 n.mile/d.
25—36 n.mile/d.

Upper figure indicates current speed in n.mile/d
Lower figure is number of observations upon which mean is based

A portion of a vector mean current chart
Predominant Current Chart

Figure 14.2. A portion of a predominant current chart
Shore Based Routeing

**Advantages**
- Access of operatives to a wide range of information.
- Personnel are experts in analysing the above.
- Tends to save money on longer voyages - over 1500 miles.

**Considerations**
- Weather needs to be a major factor in route choice.
- Few navigation restrictions along the route.
- Extremes of weather occurring in changing patterns along the track.
Ship Based Routeing

- The Master uses his/her experience to route the vessel utilising the information that can be obtained by FAX machine, websites and other media.
- Master has ultimate responsibility for the safety of the crew, ship and cargo.
- Master is ‘in situ’ (at the location)
- Master is fully aware of the effect of the environment on the vessel
- Master has fewer resources
Other Factors To Consider when deciding on Routeing

1. Navigational factors such as under keel clearance (UKC)
2. Ballast or loaded passage
3. Ocean currents
4. Areas of fog (reduced speed)
5. Ice limits (danger, reduced speed, ice class/strengthened)
6. Ice accretion
7. Length of voyage (Over 1,500 nm)
8. East or Westbound (Westbound will have seas on bow)
9. Latitude (Mid Latitude)
10. Charter party limitations
Problems with weather routeing.

**Forecast Accuracy**
Affected by the problems of obtaining data as inaccurate location of the storm centre affects the accuracy of wave height predictions. Quality of data can vary with geographical area.

**Ship Performance Curves**
Based on observation of waves-difficult to ascertain. Also difficult to measure the ship’s speed.

**Swell & Waves**
May not be a simple trochoidal shape (i.e. irregular waves affect the way in which a ship will be affected – slamming, etc.)
Usefulness of Weather Routeing

**Claimed Benefits**
- Saves Fuel
- Damage Reduction – vessels & cargo
- Voyage Time Reduced
- Comfortable experience for people

**Effectiveness**
- Voyages 1500 miles+
- Weather a major factor-extreme conditions with changing patterns
- Waters clear of navigational dangers (plenty of sea-room).
- Westbound in middle latitudes – most effective
Usefulness to Fleet Managers

- Can provide good quality weather forecasts and reports.
- Enables the vessels progress and position to be monitored more closely
- Monitor Ship and Fleet Status
- Monitor ETAs
- Monitor actual ship performance
- Improve environmental performance – fuel virtual arrival, efficiency, etc.
- Can provide quality historical data for analysis