台灣國際造船股份公司
CSBC CORPORATION,TAIWAN

船舶監控系統、船橋一人操作佈置與動態定位系統(DP system)介紹

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內容

- **動態定位系統** (Dynamic Positioning System, DPS)
- 單人操作駕駛台(One Man Bridge)
- 整合監控系統(Integrated Control & Monitor System)

動態定位系統 (Dynamic Positioning System, DPS)

- 動態定位就是船舶或海上工作平台在不使用錨泊系統情況，仍保持船舶在大洋中維持定點的控制技術
- 藉由各類傳感器檢測船舶當前運動狀態或是外力，進而驅動主推與艏側推保持船舶當前狀態

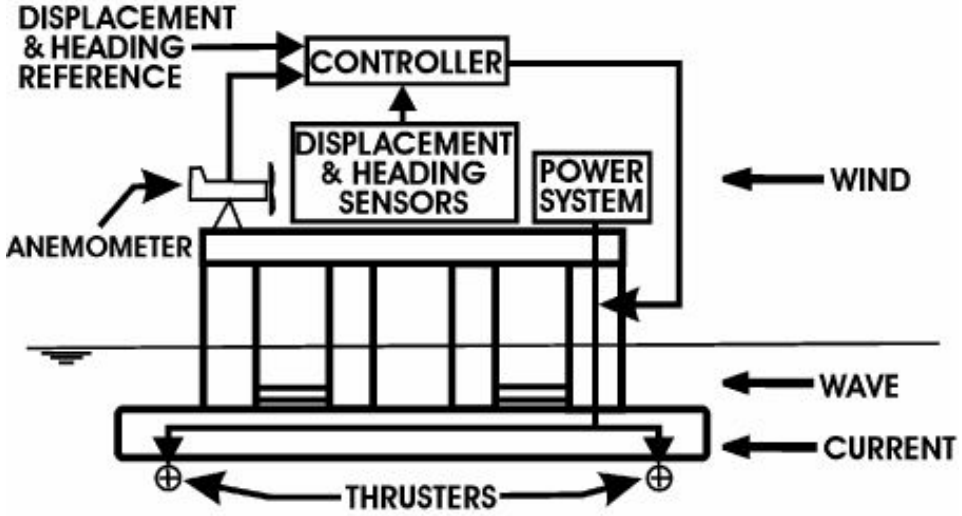


Figure 1. An example of DPS.

動態定位系統 (Dynamic Positioning System, DPS)

- 動態定位包含控制(Controller)、推進器(Thruster)、動力(Power)、感測(Sensor)等系統。

https://www.youtube.com/watch?v=_RD_dehNnp0

DPS 歷史與現狀

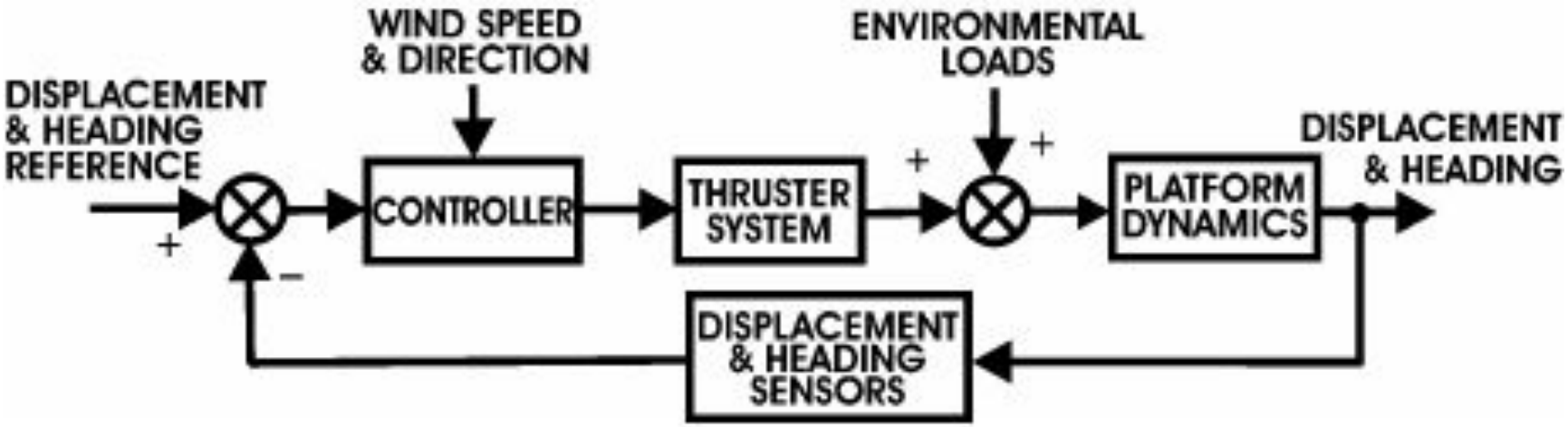
- DPS的故事始於1960年代初期
- CUSS1為第一艘具有動態定位能力的船舶(手動)
- EUREKA為第一艘真正具有自動動態定位能力的船舶

The Eureka

CUSS 1

DPS 歷史與現狀

- 初代DPS僅有單一類比控制系統(Analogue Control System)，無冗餘/備援技術(REDUNDANCY)



DPS 歷史與現狀

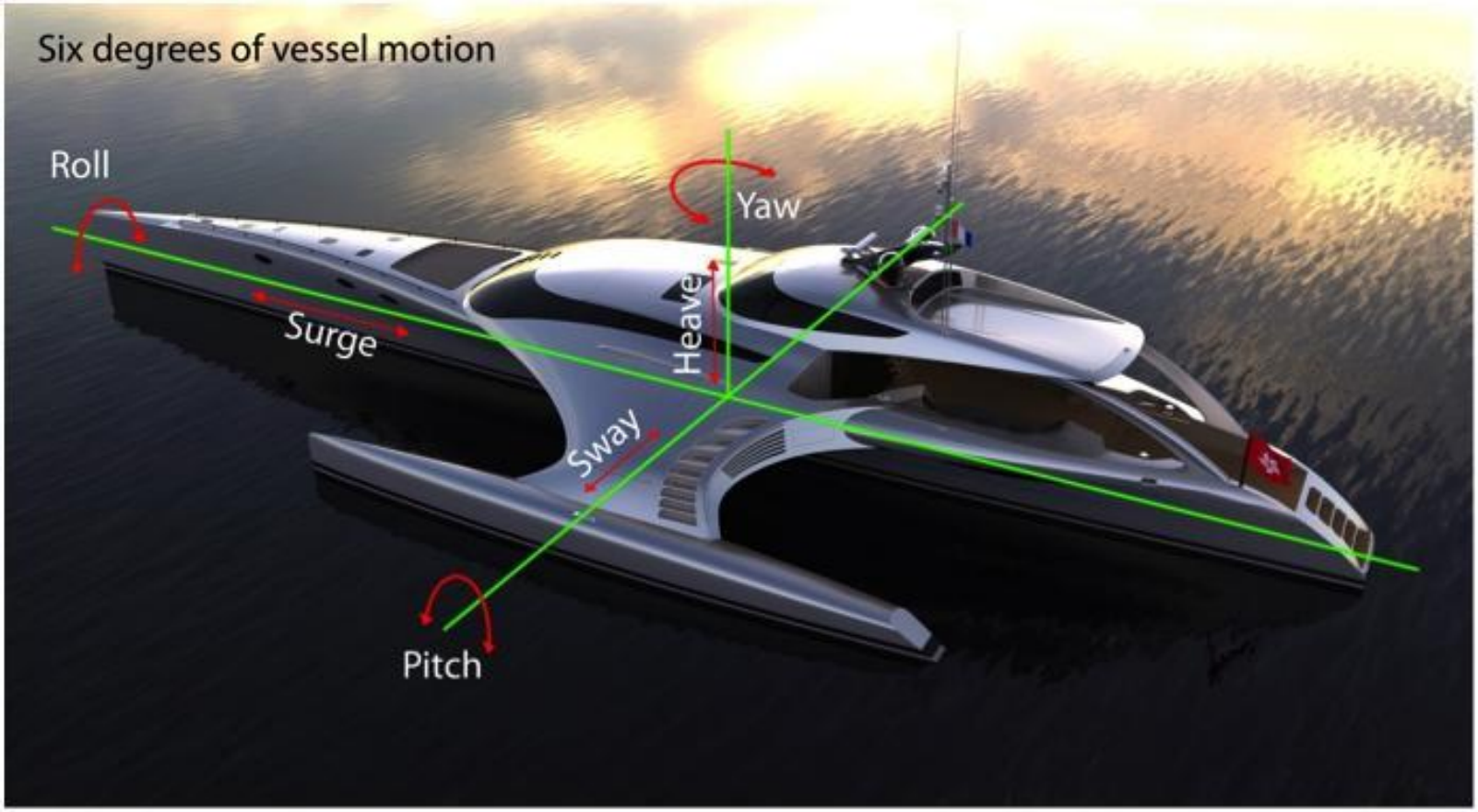
- 二代DPS發展於1970年，船舶代表”SEDCO 445”
- 啟用數位式控制系統(Digital Control System)
- 各元件皆有冗餘的概念
- 安全、穩定性和作業時間大幅改善

DPS 歷史與現狀

- 三代DPS發展於1980年
- 採用微處理機技術、Mutibus…等
- 已開始廣泛應用於各類船舶，研究船、佈纜船、起重船…等

DPS架構與原理

船舶的六種維度



https://www.youtube.com/watch?v=tUbPaohVrYU

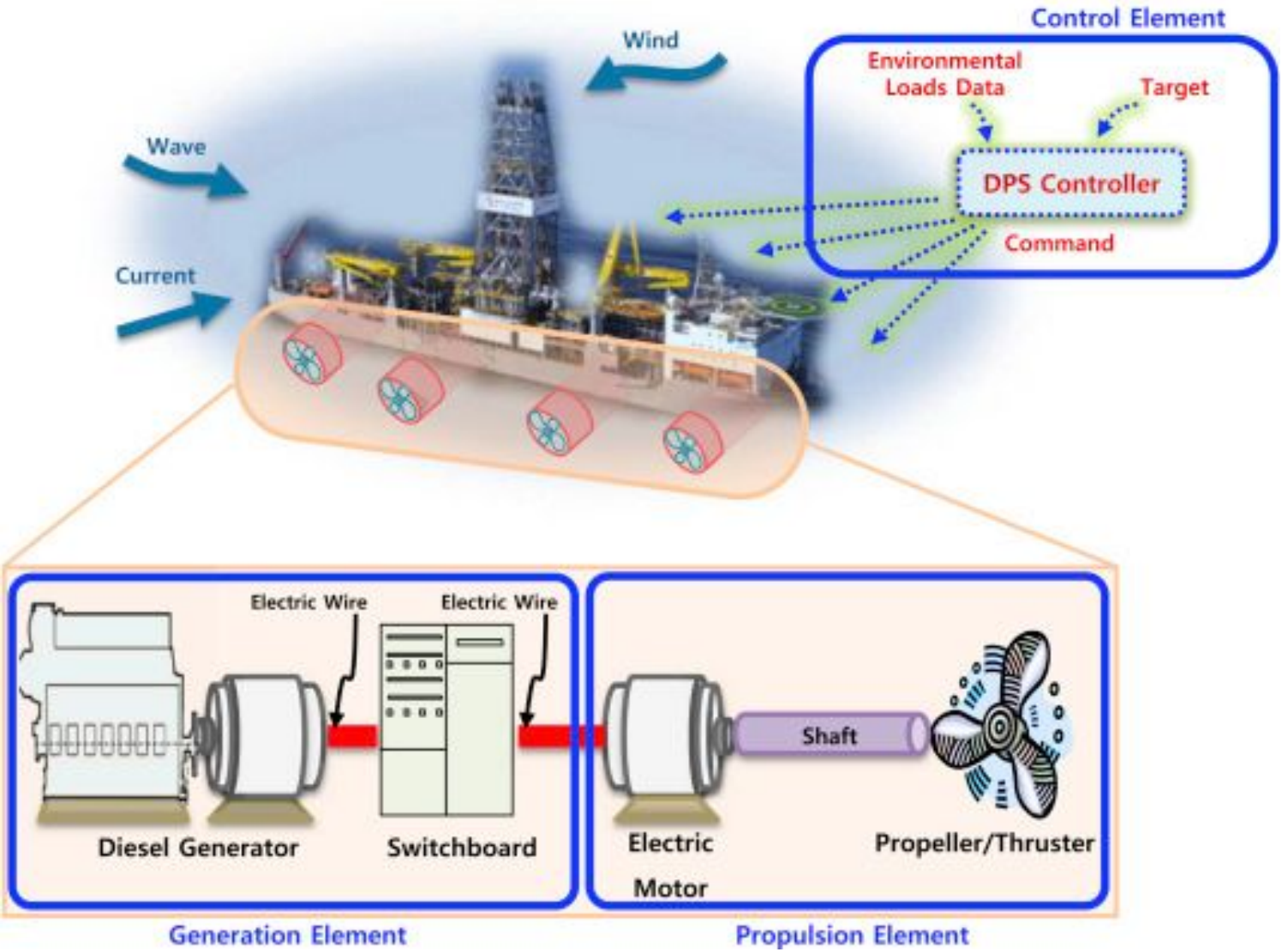
DPS架構與原理

- 船舶的六種維度
  - DPS可控的三種維度
    - Surge
    - Sway
    - Yaw
  - DPS不可控的三種維度
    - Pitch
    - Roll
    - Heave

DPS架構與原理

- 動態定位系統由以下四大系統構成
  - 感測系統(Sensor)
  - 控制系統(Controller)
  - 動力系統(Power)
  - 推進系統(Thruster)

DPS架構與原理



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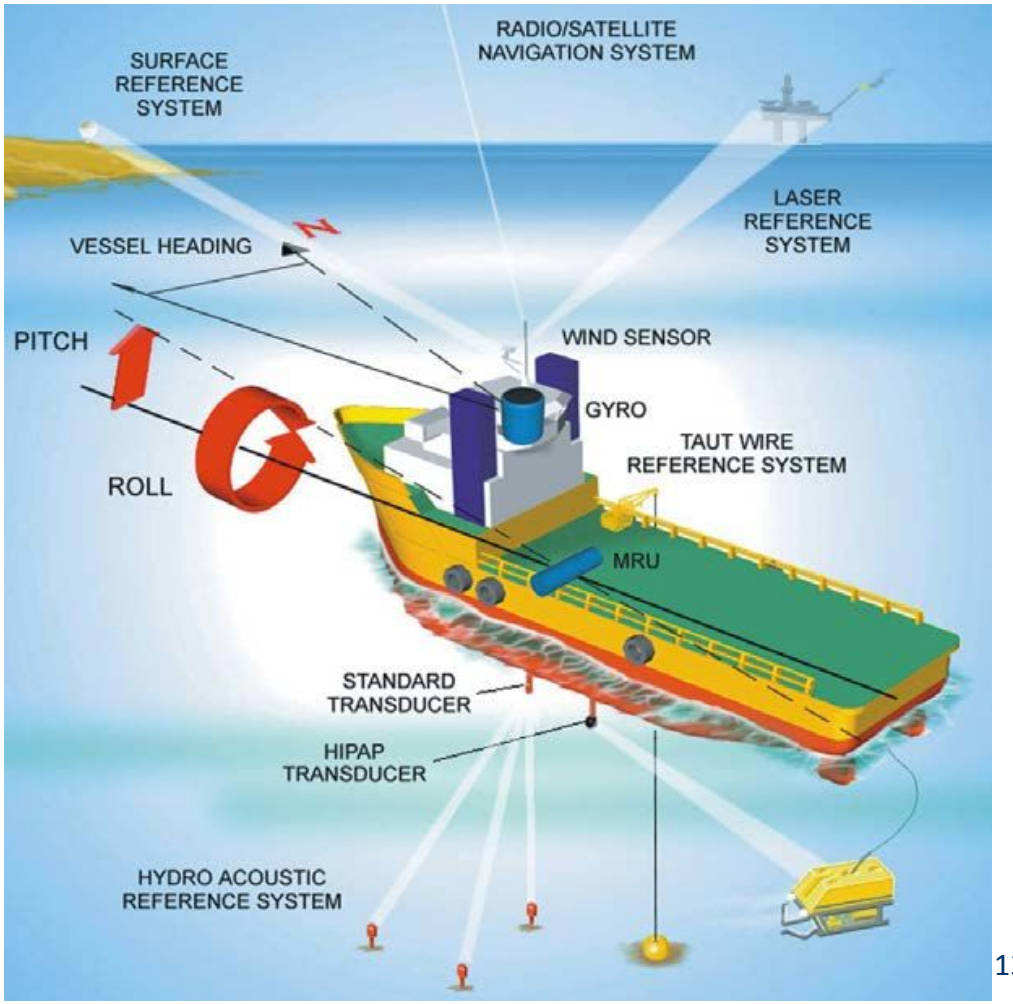
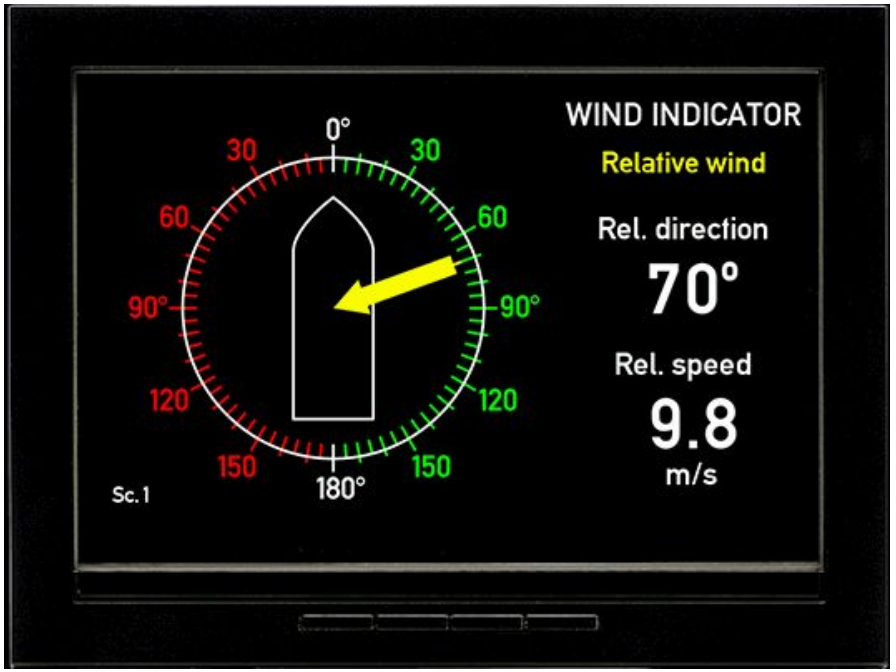
DPS架構與原理

- 感測系統(Sensor)
  - 環境資訊系統
    - 風速風向
    - MRU/VRS
    - 羅經
  - 位置參考系統
    - DGPS
    - Laser Beam/Radar Wave
    - 水下聲學
    - Taut Wire



感測系統

- 風速風向器(Wind Sensor)
  - 機械式風速風向機
  - 超音波式風速風向機



感測系統

- MRU/VRS (Motion Reference Unit/Vertical Reference Sensors)
  - 確認船舶當前的狀態與姿態
  - 測量Pitch, Roll and Heave
  - 裝於船舶重心處(center of gravity, CG)

感測系統

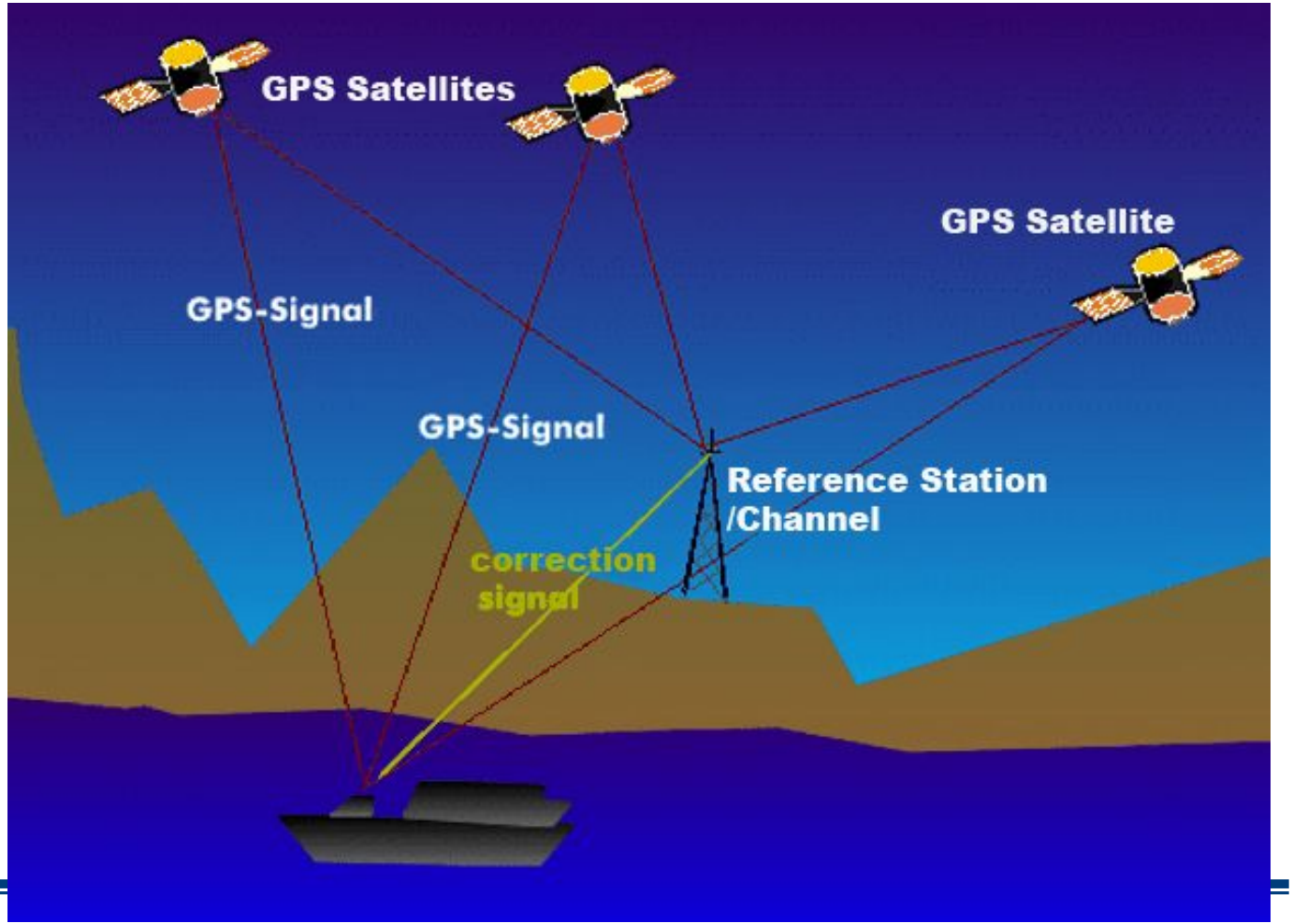
- 羅經 (Compass)
  - 探測船艏方向(Heading)，對於DPS為十分重要之資訊
  - 磁羅經、電羅經、光纖羅經

感測系統

- DGPS (Differential Global Positioning System)
  - 接收衛星信號，基於經緯度提供船舶實際位置
  - GPS 誤差30 – 100 mts
  - DGPS 誤差 小於10 mts
  - 2000/05/01 柯林頓總統(President Bill Clinton) 宣布取消SA，DGPS誤差小於3 mts

感測系統

- DGPS (Differential Global Positioning System)



感測系統

Laser Beam/Radar Wave

優點

- 適用於所有類型船舶
- 短距離準確度高
- 對於DGPS是很好的補足裝備
- 易於操作

缺點

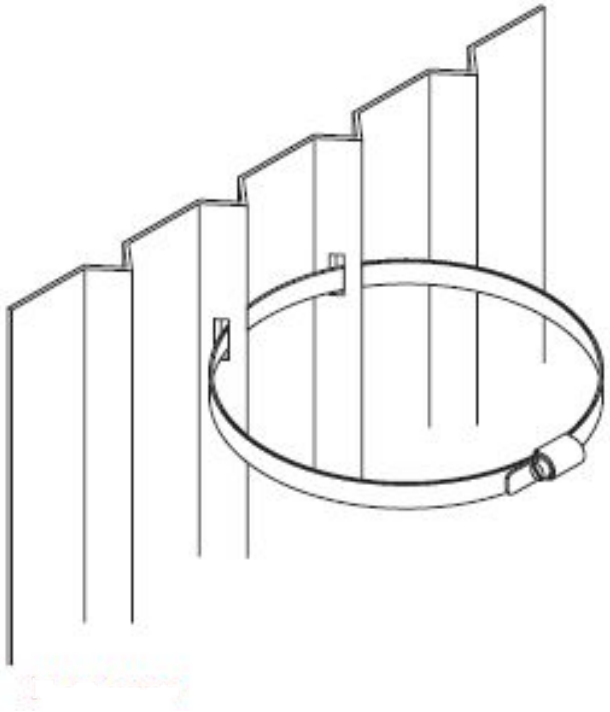
- 需在目標物安裝反射器 (Reflector/Transponder)
- 受限的視角/探測角度
- 易受天氣因素干擾
- 易受周邊結構或船舶影響

感測系統

- Laser Beam
  - Fanbeam
  - CyScan

感測系統

- CyScan / Fanbeam
  - 目標物反射器 (Reflector)

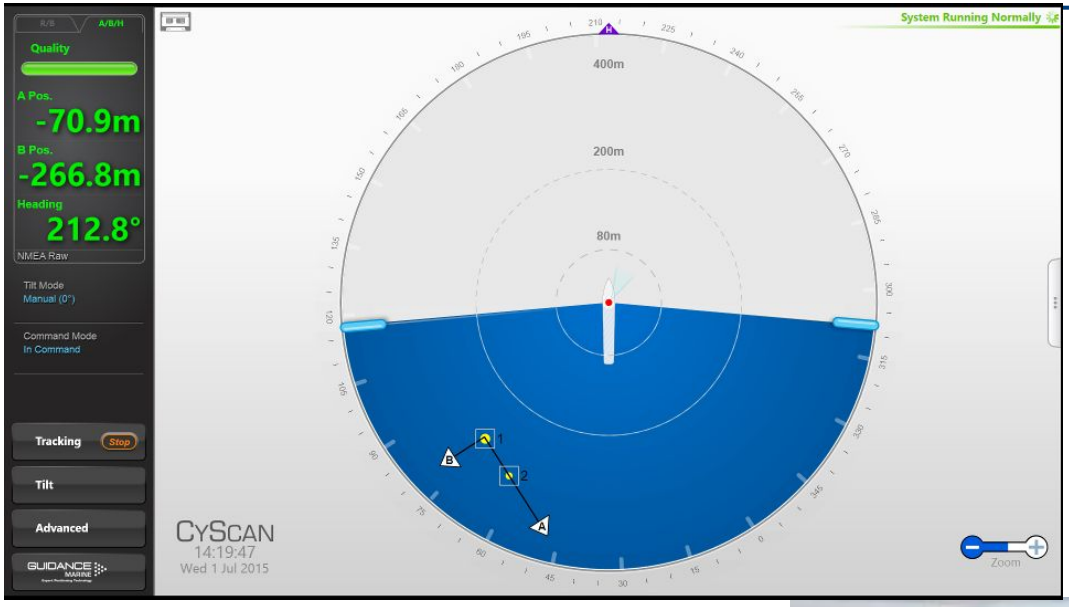


有效距離約250m

有效距離約300m

有效距離超過500m

感測系統



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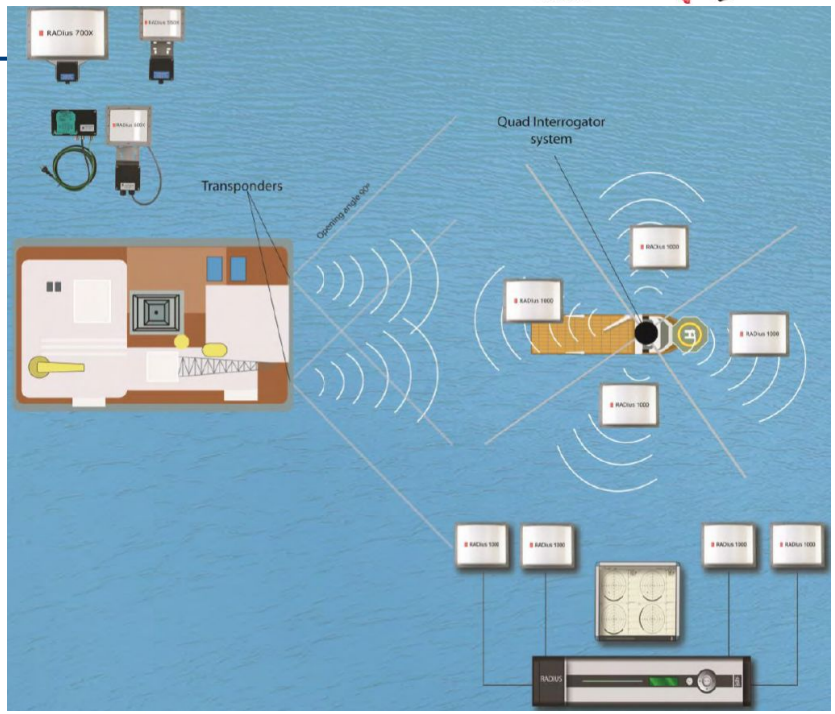
感測系統

- Radar Wave
  - Artemis
  - Radius
  - Radar Scan



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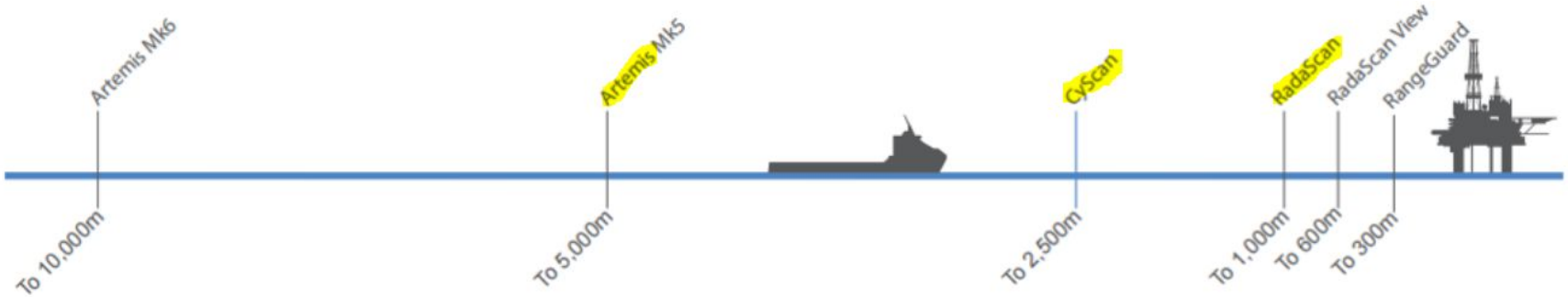
感測系統

□ Radar Wave

	□□	□□	□□□□
Artemis	□□□□□□ 360° □□□□	□□□□□□□□	1000 □□□□
Radius	□□□□□□□	□□□□□□ 90° □□□□	100 – 200 □□
Radar Scan	360° □□□□		1000 □□



感測系統

- 水下聲學
  - 利用船底換能器(Transducer)與海床應答器(Transponder)發射接收信號進行定位
  - 易受推進器運轉干擾
  - 常用三種類型
    - 長基線 (Long Baseline)
    - 短基線 (Short Baseline)
    - 超短基線 (Ultra- or Super- Short Baseline, USBL or SSBL)

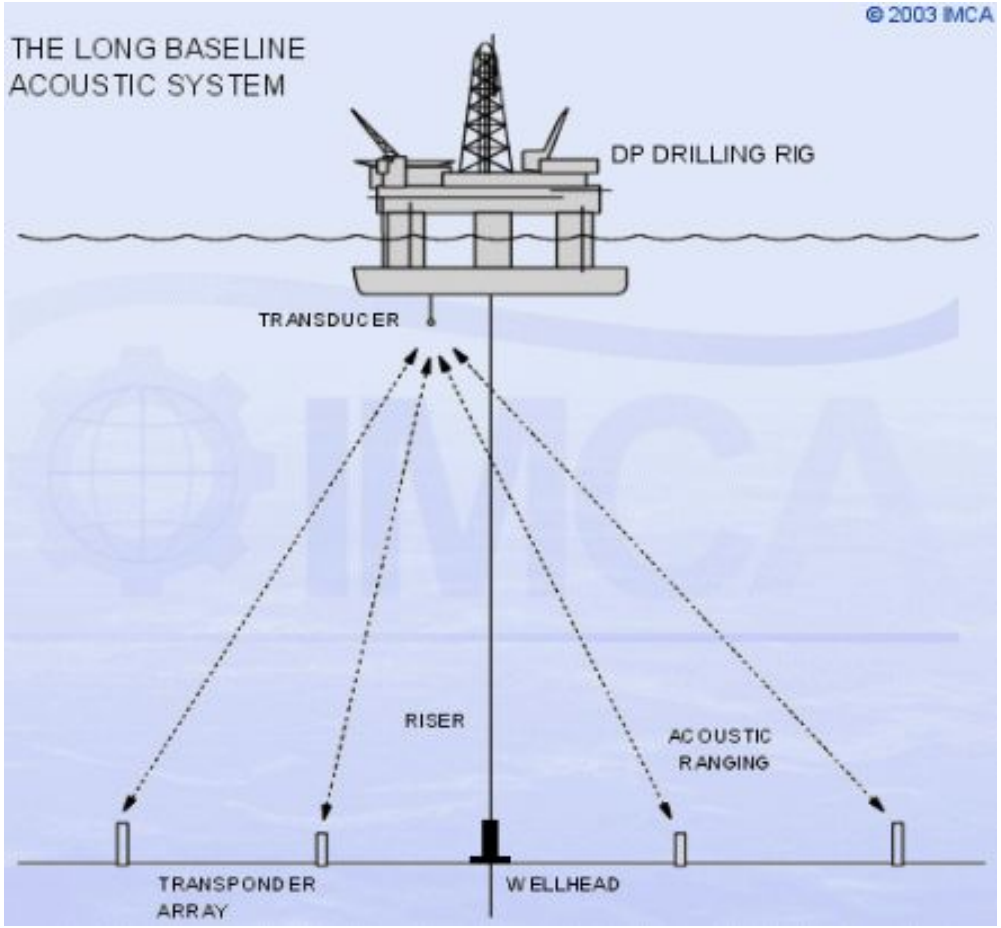
□□□□□□□□	□□□□
LBL	<10 cm
SBL	20 ~ 50m
USBL, SSBL	100 ~ 6000m

感測系統

- 長基線 (Long Baseline, LBL)
  - 海床上需架設三組以上的應答器
  - 利用換能器與各應答器間的傳送信號時間不同得知船舶位置
  - 定位精準度高於短基線與超短基線
  - 常用於深水區 (> 1000m)

感測系統

- 長基線 (Long Baseline, LBL)



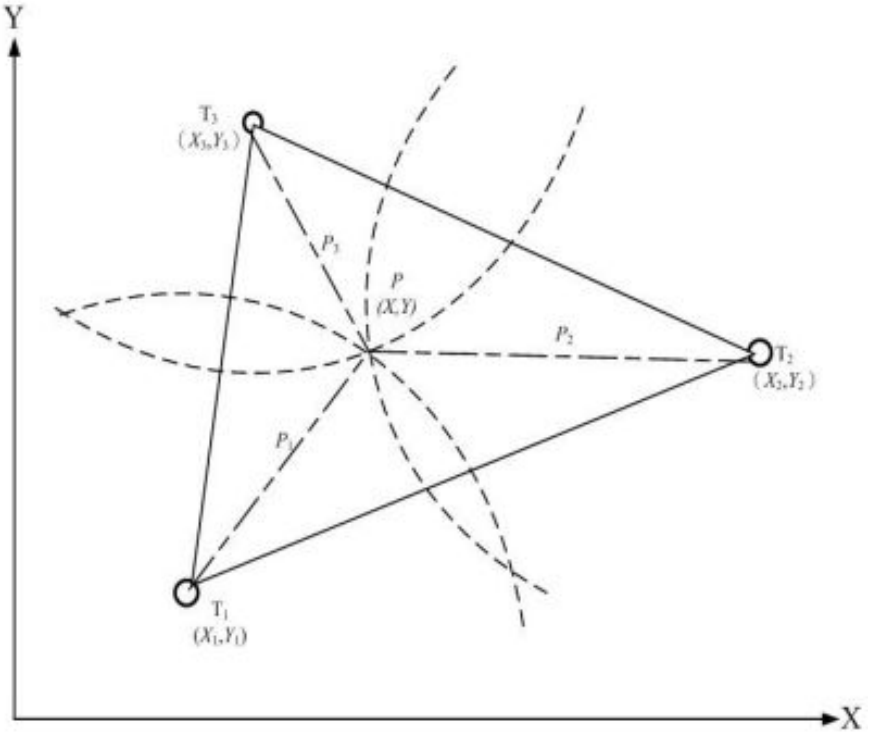


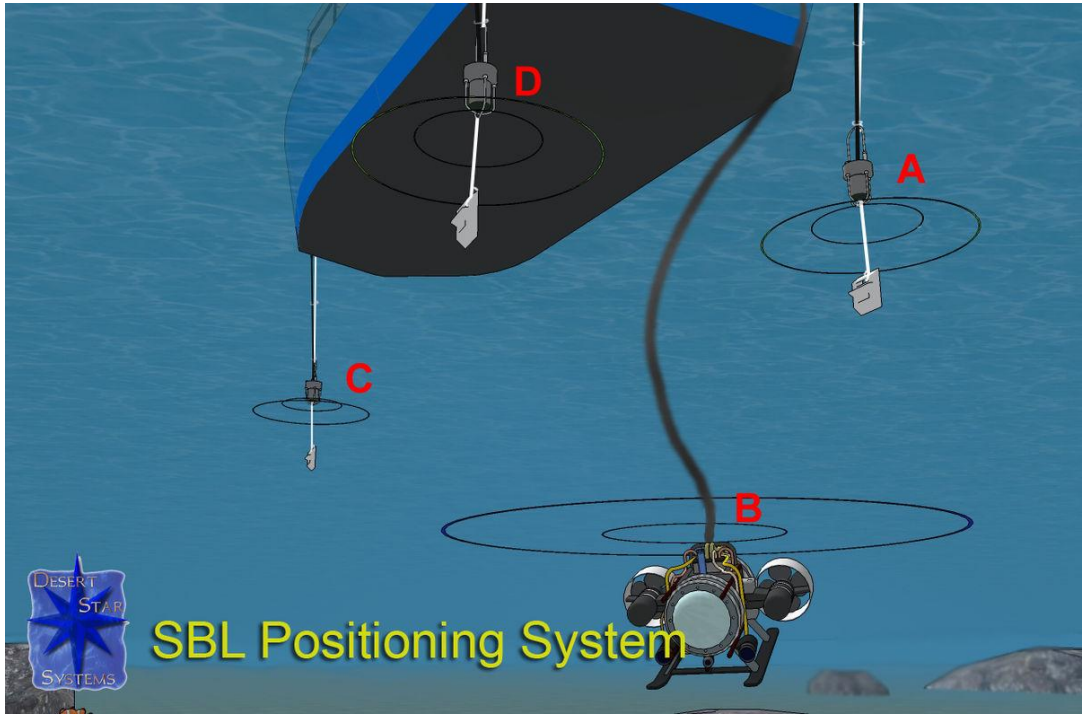
圖 1-1 長基線定位示意圖

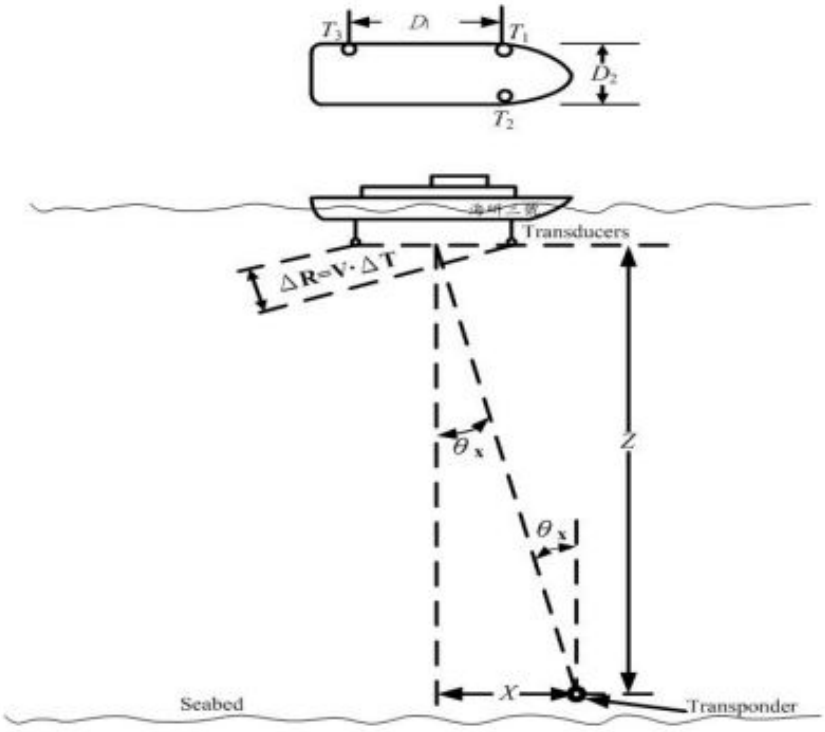
感測系統

- 短基線 (Short Baseline, SBL)
  - 三組以上換能器安裝於船底
  - 盡可能拉大換能器間的距離(> 10m)
  - 不須安裝應答器於海床
  - 同LBL，利用時間差得知船舶位置

感測系統

- 短基線 (Short Baseline, SBL)



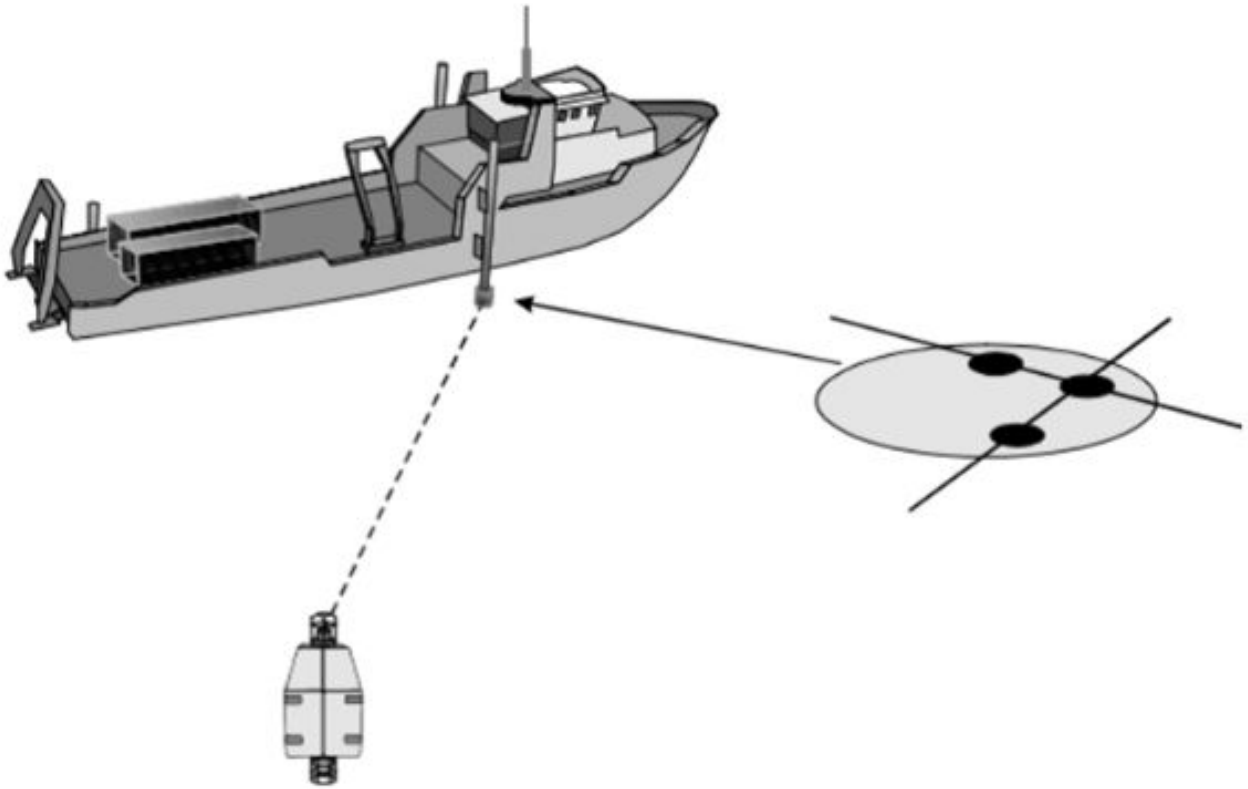


感測系統

- 超短基線 (Ultra- or Super- Short Baseline, USBL or SSBL)
  - 僅需一組應答器
  - 將數個換能器併於單一收發器中
  - 不適用時間差計算，改由信號接收角度的相位差確認船舶位置
  - 需搭配DGPS、MRU、Gyro Compass提高定位精準度

感測系統

- 超短基線 (Ultra- or Super- Short Baseline, USBL or SSBL)

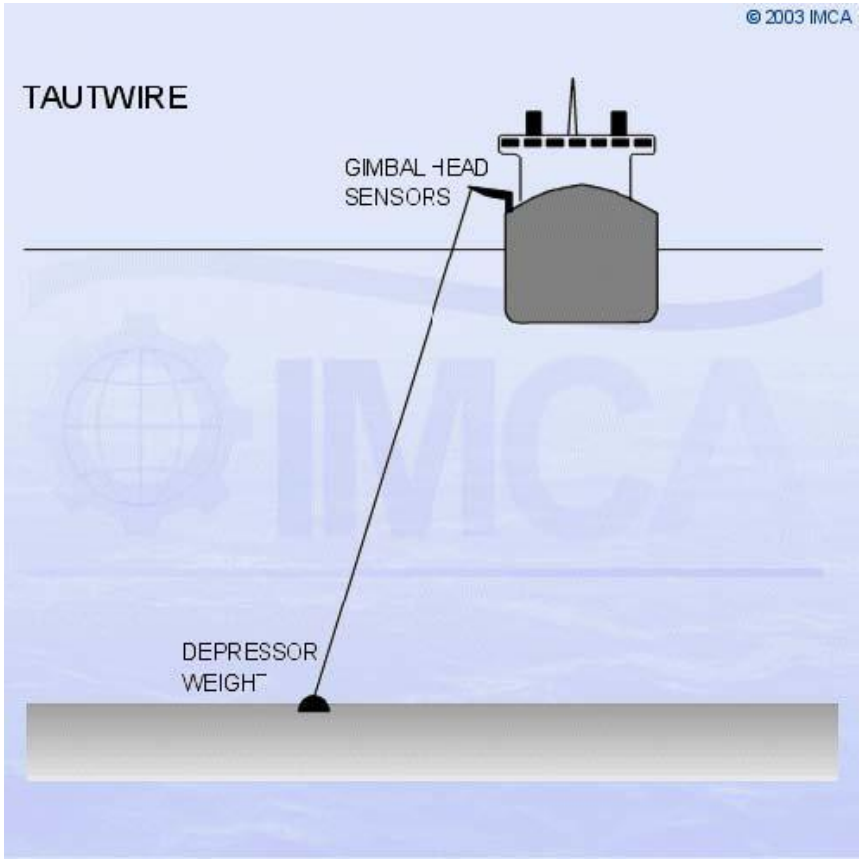


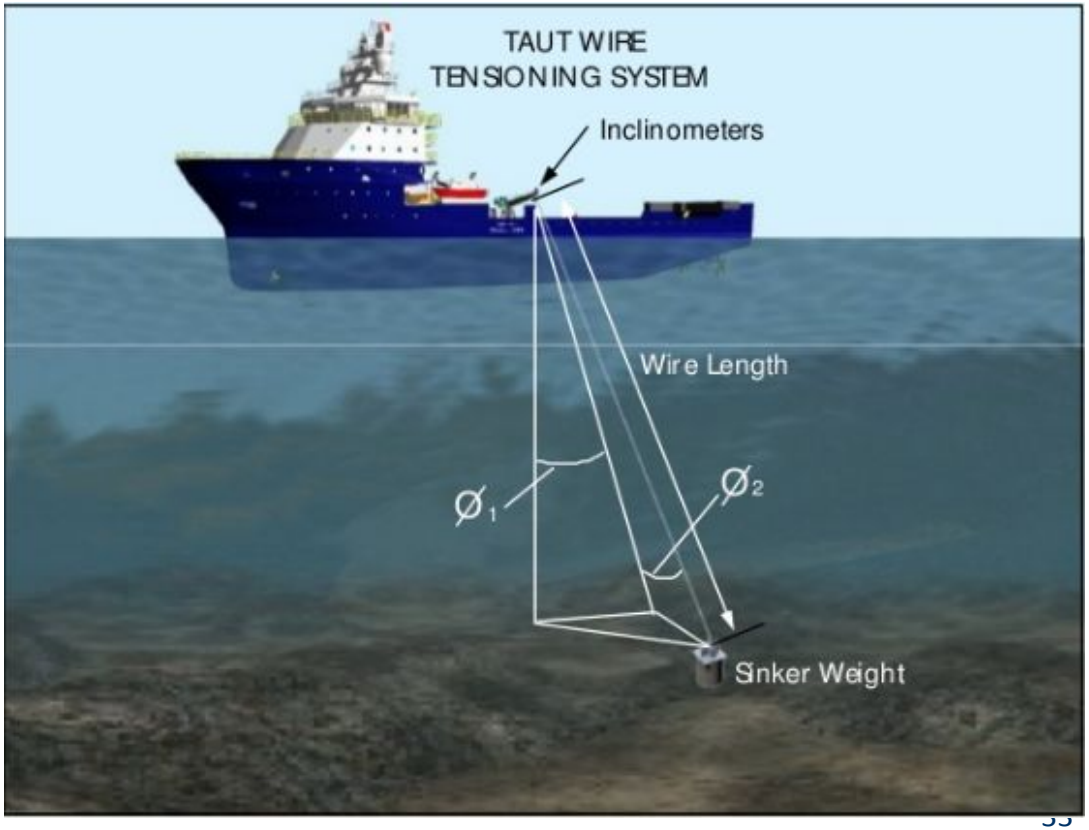
感測系統

- Tautwire
  - 為機械式量測系統
  - 測量繩索的傾角與長度確定船舶位置
  - 範圍小、距離短
  - 快速安裝，精準度高

感測系統

Tautwire





控制系統

- 包含控制台與信號處理櫃
- 控制台提供DPS人機操作介面(Human Machine Interface, HMI)。主要負責操作與控制。
- 信號處理櫃負責信號蒐集與處理，透過演算法對船舶推進器下達指令，從而控制船舶位置

控制系統

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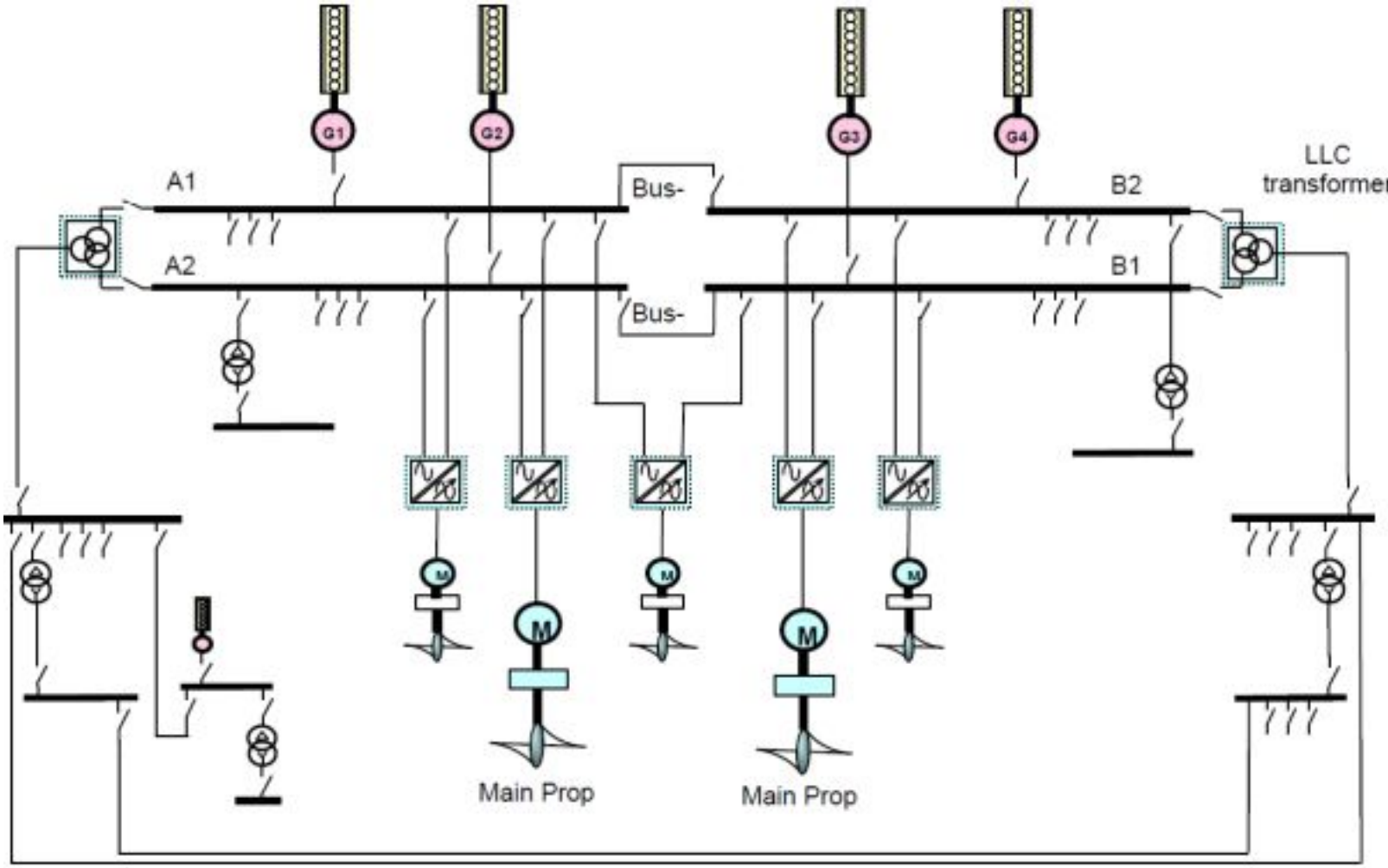
動力系統

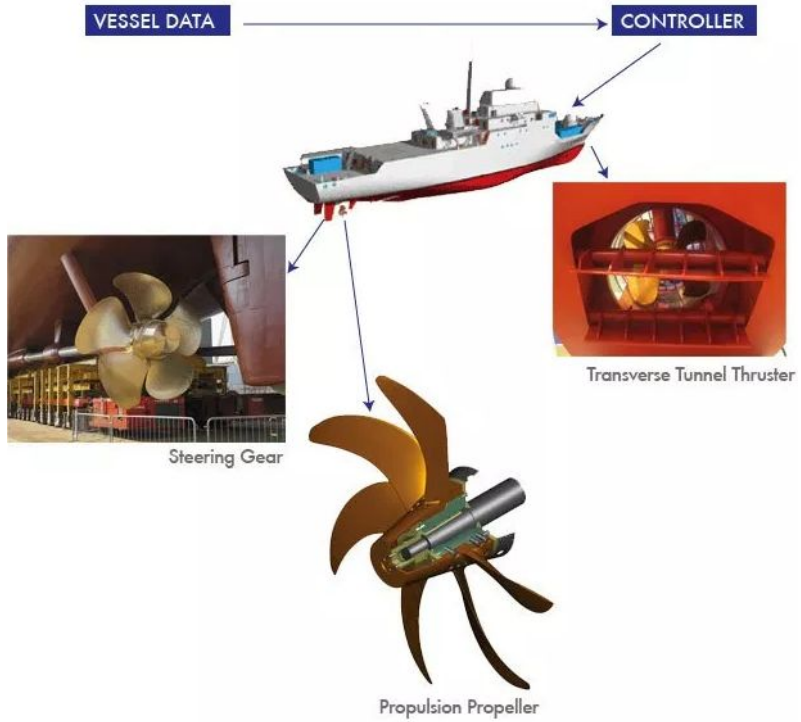
- 提供DPS電源的必要組件與系統
  - 動力機組:柴油機、燃氣輪機、蒸氣輪機
  - 配電盤
  - 分電箱
  - UPS
- DPS需備有一不斷電系統(UPS)。斷電後最少維持30 min系統運作

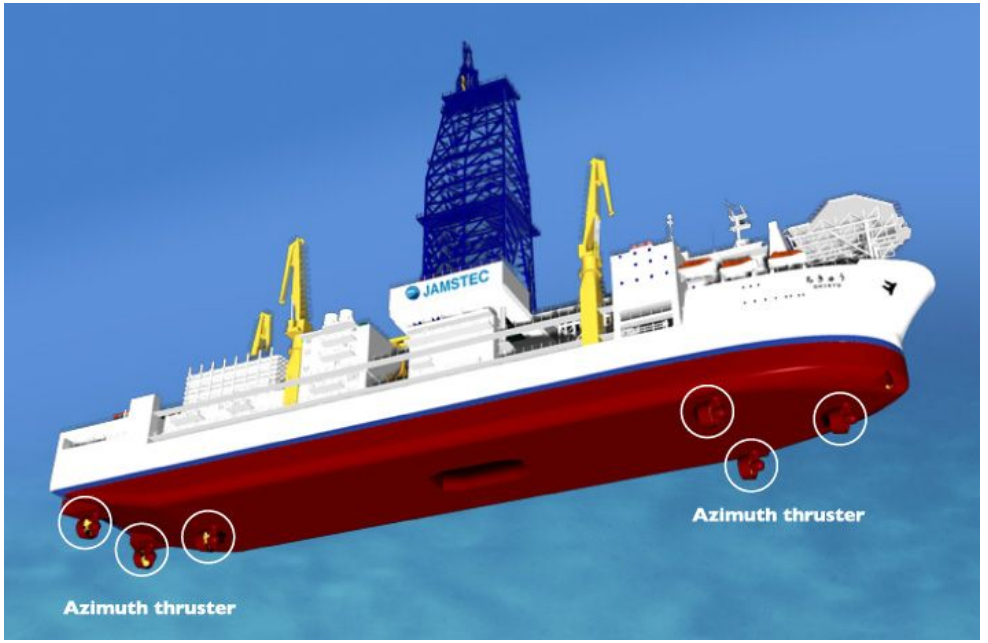
動力系統


G1
G2
G3
G4
A1
A2
Bus-
Bus-
B2
B1
LLC
transformer
M
M
M
Main Prop
Main Prop

推進系統

- 根據控制系統指令，產生推力和力矩，抵銷船舶外在推力，使船舶保持相對位置
- 推進器包含主推螺槳、舵、艏側推...等





應用領域

- 鑽井船

- 佈管船

- 挖泥船

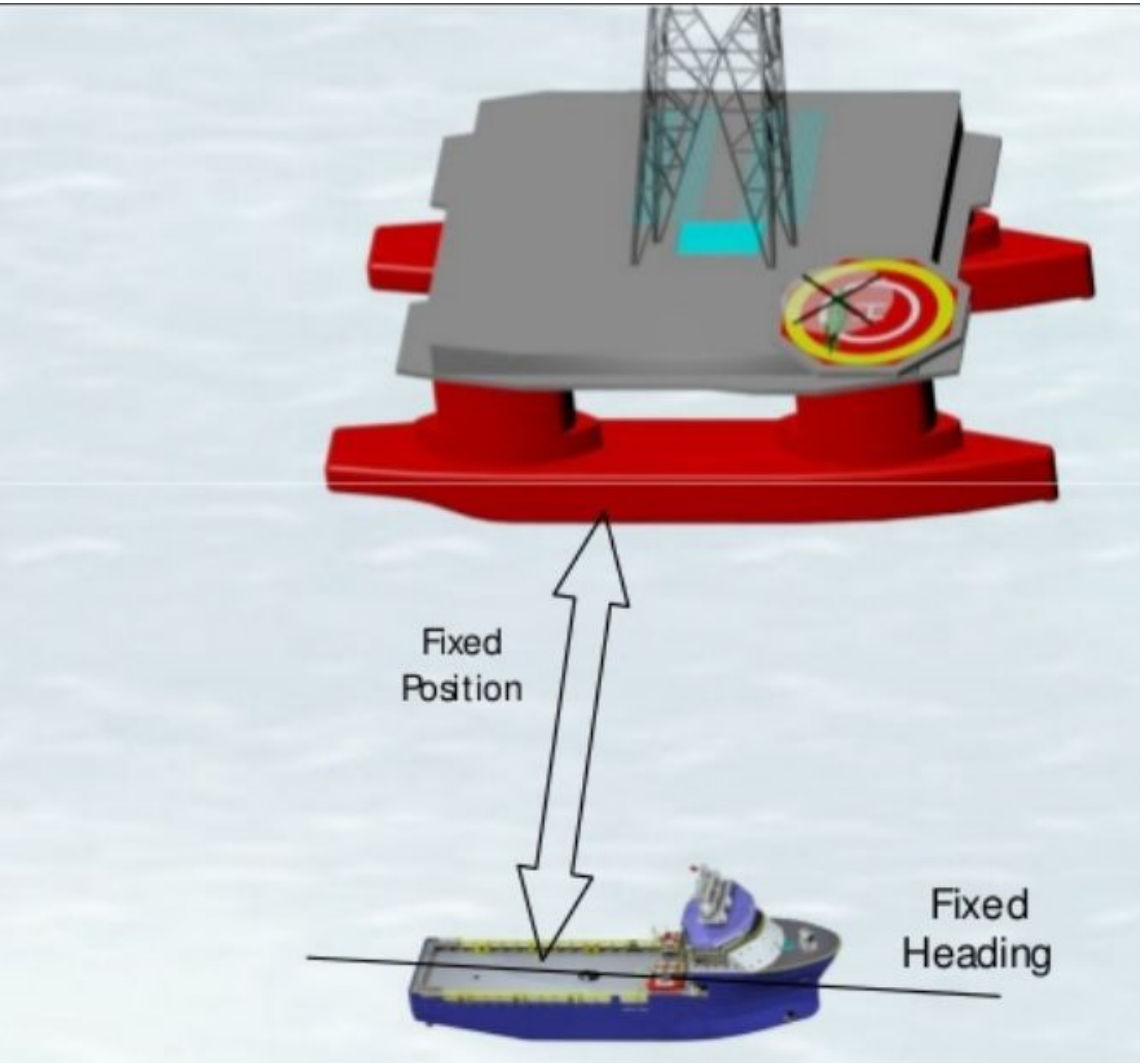
- 起重駁船

應用領域

軍艦

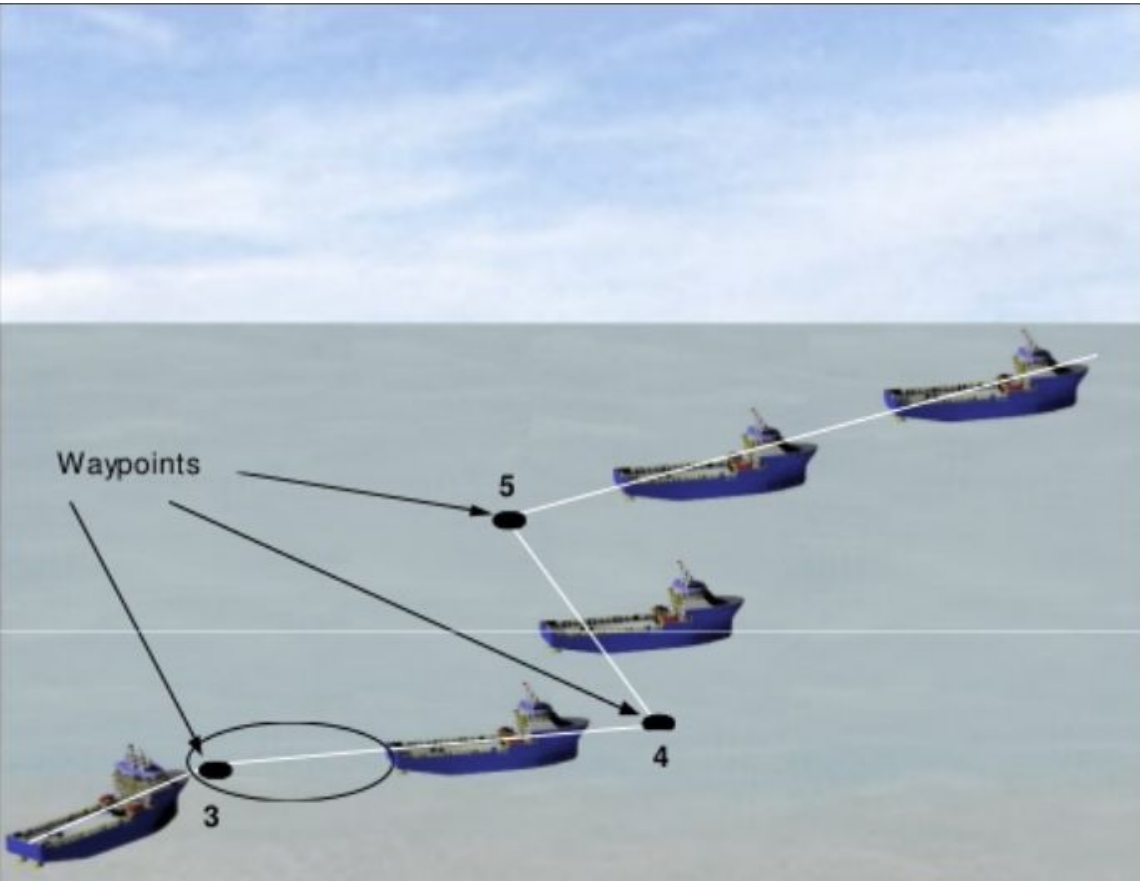
半潛式甲板載運船

應用領域



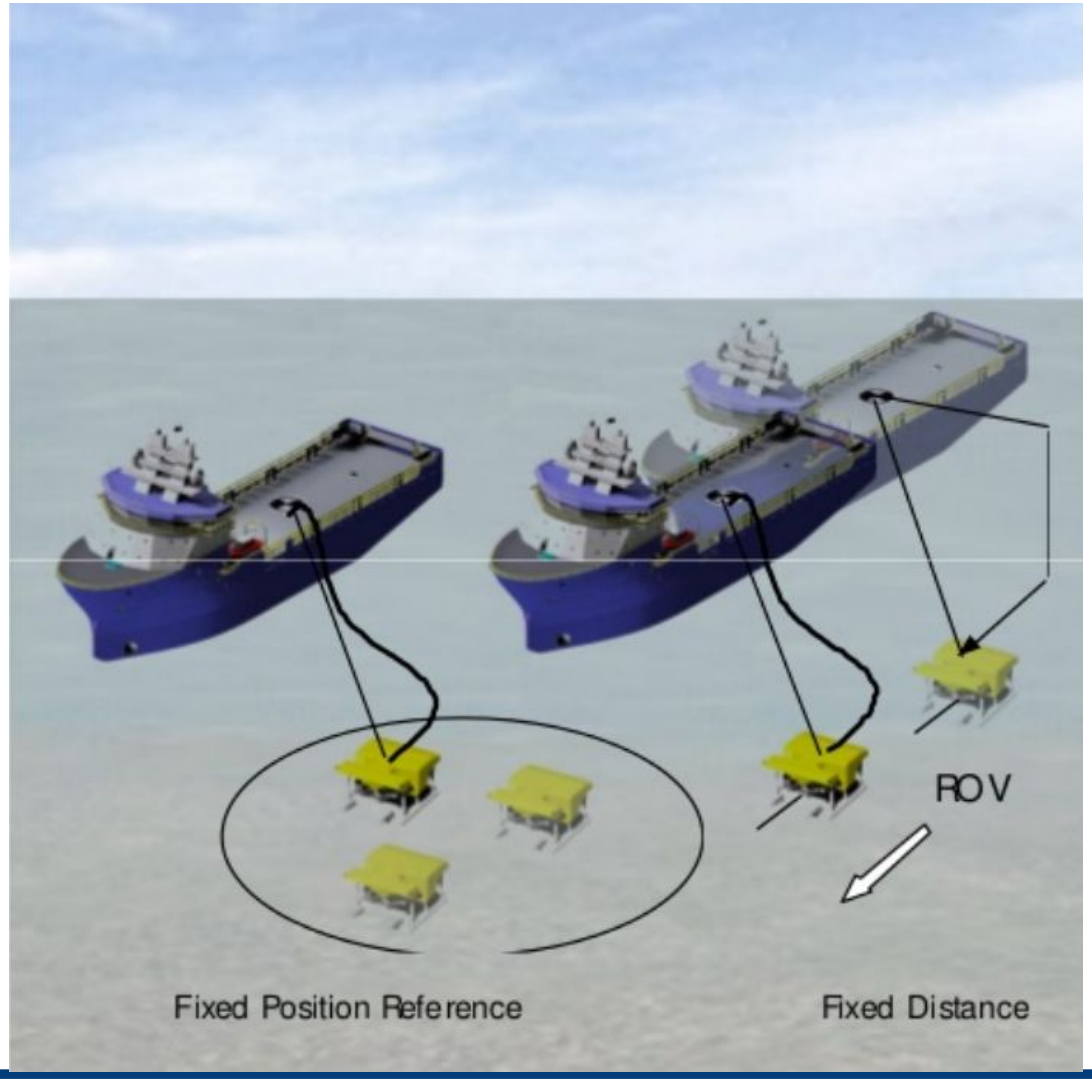
- 定點控制(Keep Position)：透過DPS發出指令使船舶固定在設定點附近

應用領域



- 軌跡追蹤(Track Follow)：延一條預定路線前進，船舶狀態根據外在環境自行調整
- 循線控制：類似軌跡追蹤，但艏向需與規劃路線一致

應用領域



- 目標追蹤(Follow Target)：一般用於ROV工作母船，可即時跟隨ROV運動

單人操作駕駛台
(One Man Bridge)

單人操作駕駛台 (One Man Bridge)

- 單人駕駛台
  - 透過自動化設計概念，整合操作船舶所需相關面板集中佈置
  - 另包括視線、工作環境、通道 & 照明等要求
  - 相關裝備皆在駕駛員觸手可及之範圍內
  - 各船級社皆提出相應的船籍符號及要求
    - ABS-NBLES、LR-NAV1、BV-SYS-NEQ、DNV-NAUT-OC 等等

工作環境規定

振動(Vibration)

- 0.5Hz到5Hz的振動頻率不得大於0.16 m/s^2
- 5Hz到100Hz的振動頻率不得大於5 mm/s

B 100 Vibration

101 Uncomfortable levels of vibration causing short and/or long term effects on human body shall be avoided in the bridge area.

Guidance note:

The vibration levels on the bridge deck shall not exceed 0.16 m/s^2 from 0.5 Hz to 5 Hz, and 5 mm/s from 5 Hz to 100 Hz

噪音(Noise)

B 200 Noise

201 Uncomfortable levels of noise, and noise which may affect safe and efficient bridge operation, shall be avoided in the bridge area. Consideration shall be made to the need for speech, telephone and radio communication and for hearing audible alarms and sound signals.

Guidance note:

The noise level (sound pressure) for the wheelhouse workplace shall not exceed 65 dB(A) while the ship is underway and with all normal bridge equipment in operation (*measured in good weather conditions*).

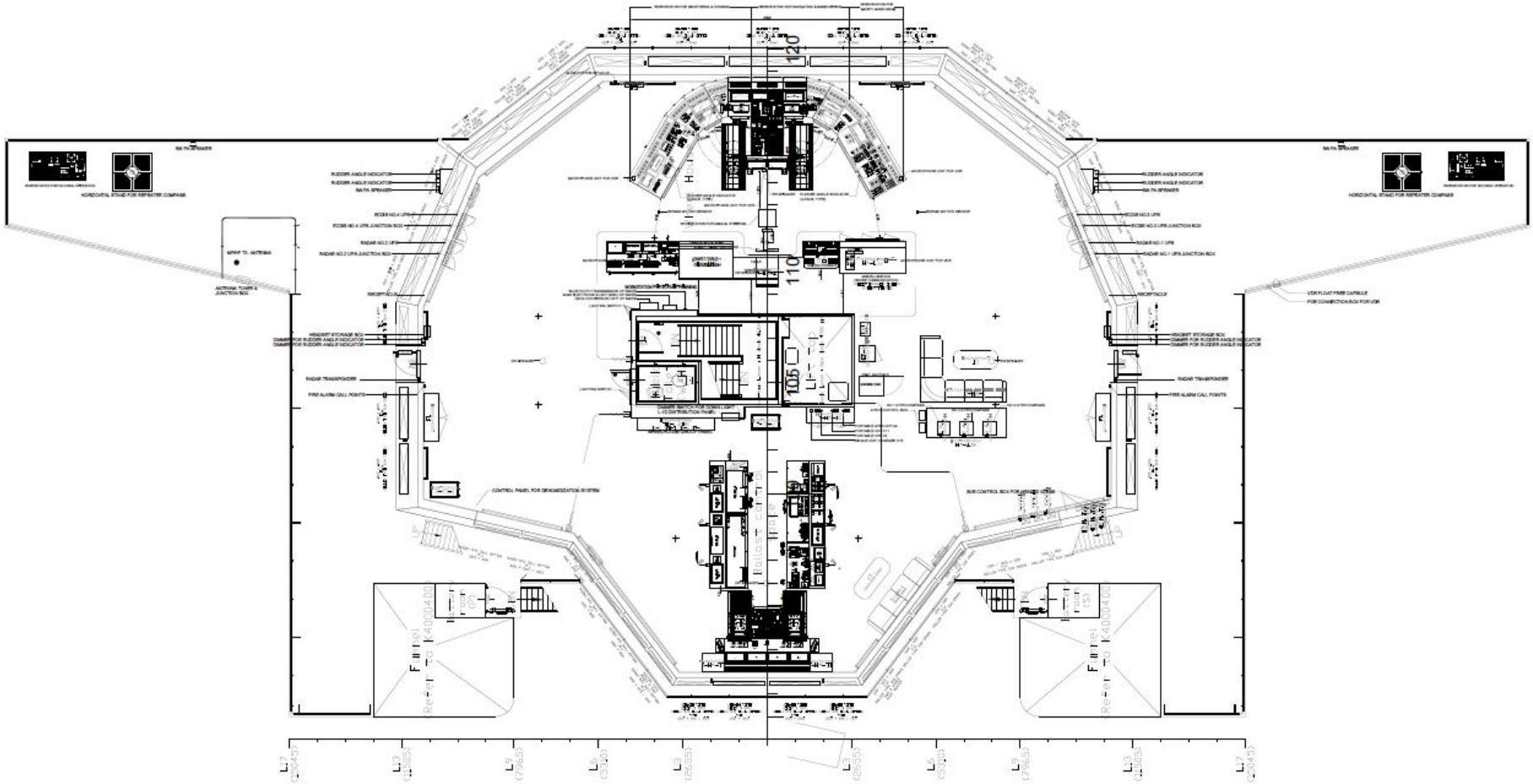
工作環境規定

- 環境溫度與通風
  - 室外溫度-10°C – 35°C時，室內須維持18°C – 27°C;且溫度變化不超過5°C
  - 在室內溫度18°C – 23°C時，通風應保持0.3 m/s，不得超過0.5 m/s

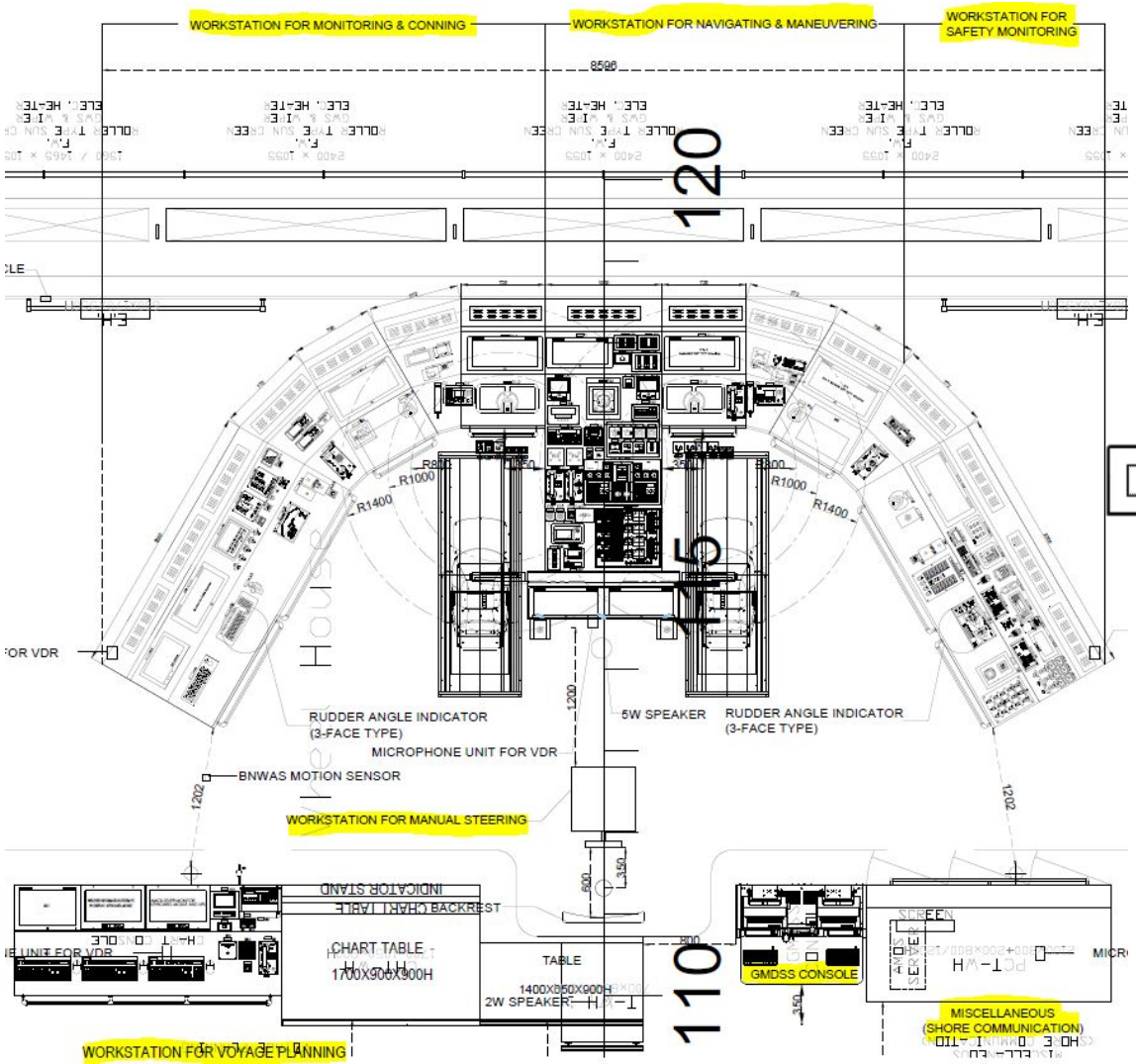
It shall be possible to maintain the effective temperature range in the wheelhouse within 18°C to 27°C for an external temperature range of -10°C to +35°C. The temperature gradient inside of the wheelhouse shall not exceed 5°C.

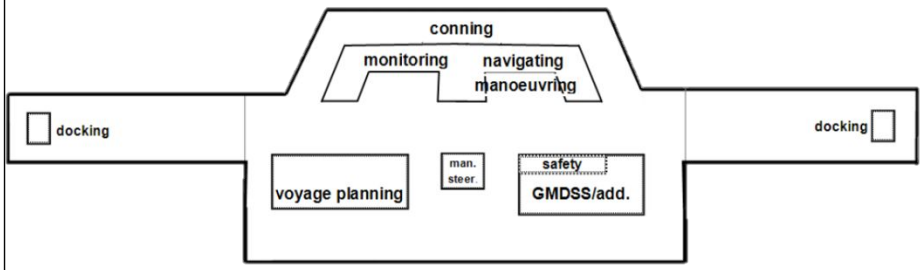
— In general, air movement should vary with the different temperatures in the wheelhouse: the higher the temperature, the greater the air movement needed for comfort. With temperature maintained in the range 18°C to 23°C, the air movement should preferably be 0.3 m/s and not exceed 0.5 m/s.

駕駛台安排



駕駛台安排





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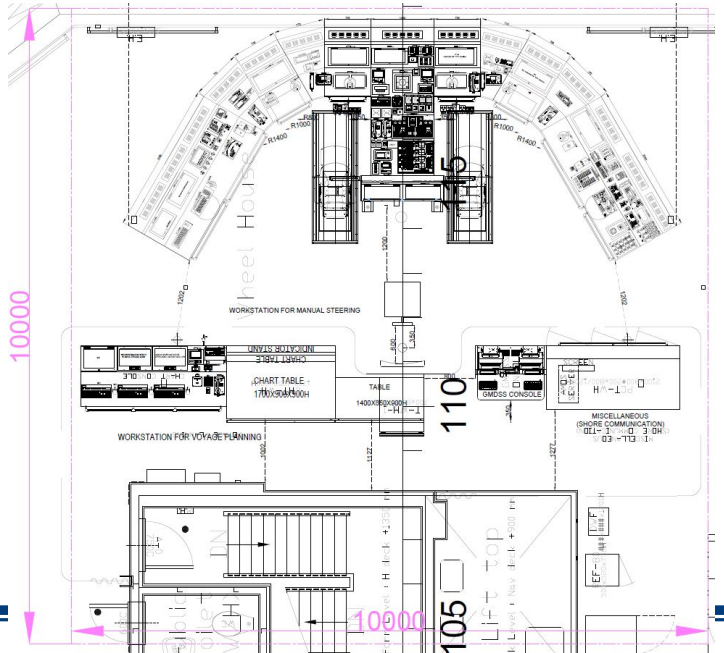
駕駛台安排

- 除靠泊工作站(Docking Workstation)外，所有駕駛台內的工作站皆須坐落於10m * 10m範圍內

105 The individual workstations allocated primary bridge functions shall be arranged for easy operation by one person as well as allowing close co-operation between personnel at the various workstations when manned for individual operations.

Guidance note:

The workstations for primary bridge functions, except for docking operations, should be located within an area not more than 10 m wide.



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通道/走道規定

- 通往兩翼的通道需1200mm，且任一障礙物點不得小於700mm
- 兩獨立的工作站間距離不得小於700mm

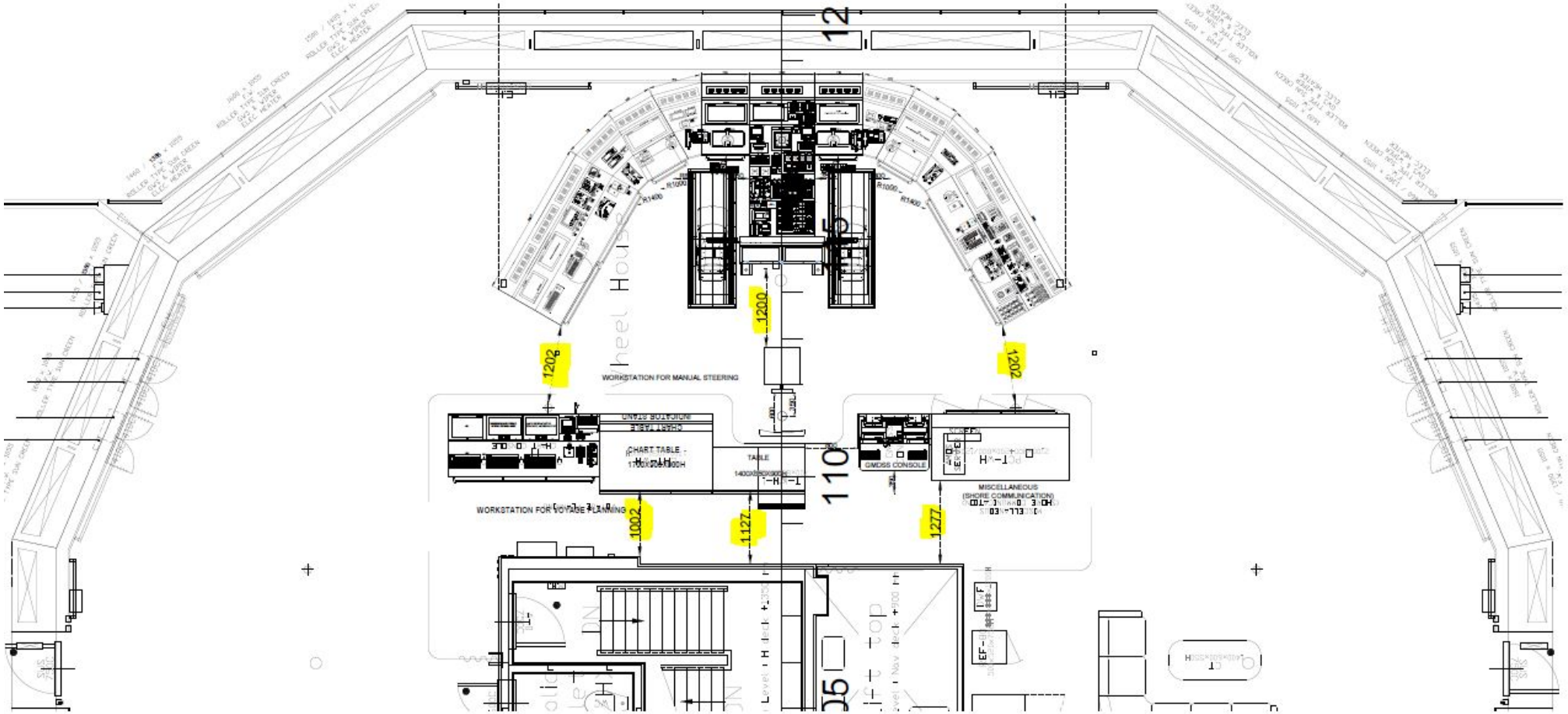
C 200 Passageways

201 There shall be a clear route across the wheelhouse from bridge wing to bridge wing for two persons to pass each other. The width of the passageway shall in the main be 1200 mm and not less than 700 mm at any single point of obstruction.

202 The distance between separate workstation areas shall be sufficient to allow unobstructed passage for persons not working at the stations. The width of such passageways shall not be less than 700 mm allowing for persons sitting or standing at their workstations.

203 If the consoles of the monitoring and navigating & manoeuvring workstations are not to be located directly against the front bulkhead of the wheelhouse then the distance between the front bulkhead and the consoles shall be sufficient for one person to pass a stationary person. The width of this passageway should preferably be 1000 mm and shall not be less than 800 mm.

通道/走道規定

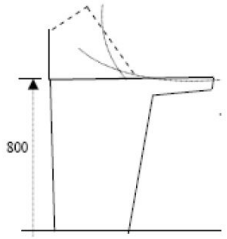

WORKSTATION FOR MANUAL STEERING
WORKSTATION FOR VOYAGE PLANNING
CHART TABLE
TABLE
GMDSS CONSOLE
MISCELLANEOUS
(SHORE COMMUNICATION)
1200
1202
1002
1127
1277
110

駕駛台高度限制

- 操作台區分為兩區
  - 用於顯示資訊的傾斜區
  - 用於操作者輸入裝備的水平區

To provide a functional reach from standing position, the height of console desktops above bridge deck surface, equipped with UIDs should preferably be 800 mm and not less than 750 mm.

---e-n-d---of---G-u-i-d-a-n-c-e---n-o-t-e---



駕駛台高度限制

- 用於“監視”與”航行操作”操作台總高不得高於1200 mm，以可視高度1500 mm為基準
- 其餘操作台總高不得高於1300 mm

305 *Console height*

The consoles forming the workstations for monitoring and navigating & manoeuvring shall not obstruct the lower part of the window panes as seen from a sitting position behind the consoles (eye height 1500 mm). The height of these consoles shall not exceed 1200 mm.

Guidance note:

A console height of 1200 mm is acceptable even if it should interfere with the line of sight from an eye height of 1500 mm providing the height of the chair can be adjusted to compensate for the obstruction.

---e-n-d---of---G-u-i-d-a-n-c-e---n-o-t-e---

306 The height of consoles forming other workstations that are intended to be operated by the OOW shall not exceed 1300 mm. If such workstations are to be located within the horizontal field of vision required from the workstations for monitoring and navigating & manoeuvring then the console height shall not exceed 1200 mm.

視線規定

- 在駕駛室內須可以清楚外在360°環境情況。不要求在一定點完成，但不超過兩點；兩點間距離不超過15m

203 A horizontal field of vision (FOV) to the horizon of 360° shall be obtained by using not more than 2 positions within the confines of the wheelhouse on either side of the workstation for navigating & manoeuvring and being not more than 15 m apart. (Fig.1). The 360° view shall as a minimum be attained 1 nautical mile from the observers position.

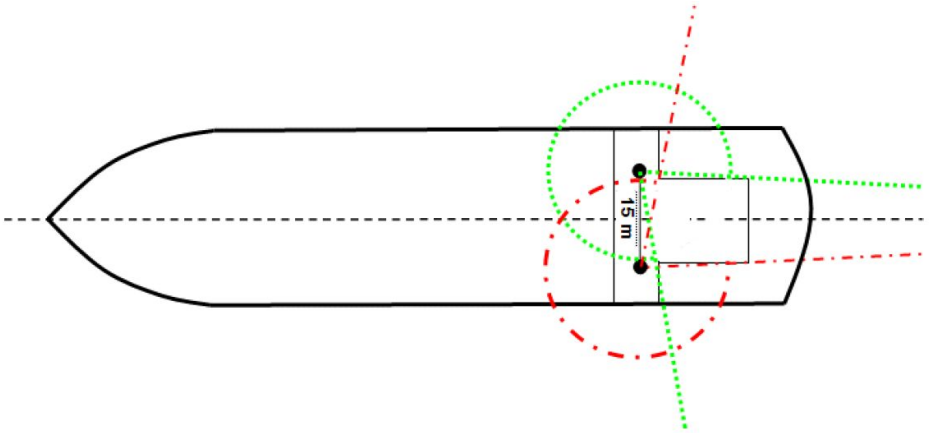


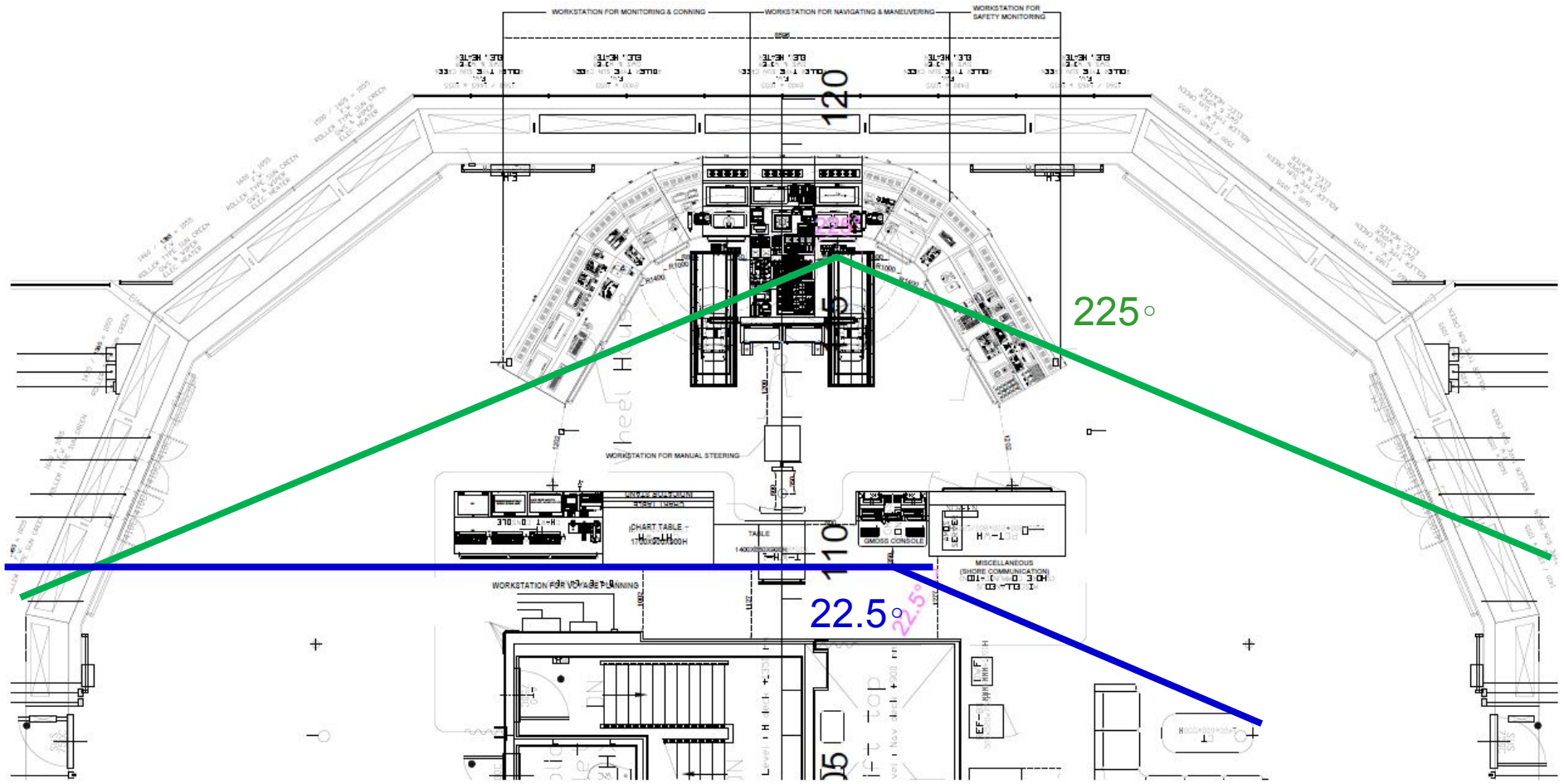
Fig. 1
Two positions combined provide ≥ 360° field of vision from inside the wheelhouse

視線規定

- 站於“監視”與”航行操作”操作台，水平視線225°內不得有阻擋物

- 針對GMDSS裝備操作台或安全監控操作台，其水平視線為左邊90°至右邊後方22.5°

視線規定



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Within Reach (伸手可及)

- Within Reach (伸手可及)
  - 定義由”Standing Position”
    - 前方800 mm內; 兩側1400 mm內
  - 定義由”Seated Position”
    - 位置點定於距離操作台邊350 mm處
    - 所定義之裝備應於1000 mm內
    - 使用次數頻繁之裝備應於800 mm內 (電話、主推控制盤、操舵系統…等)

Within Reach (伸手可及)

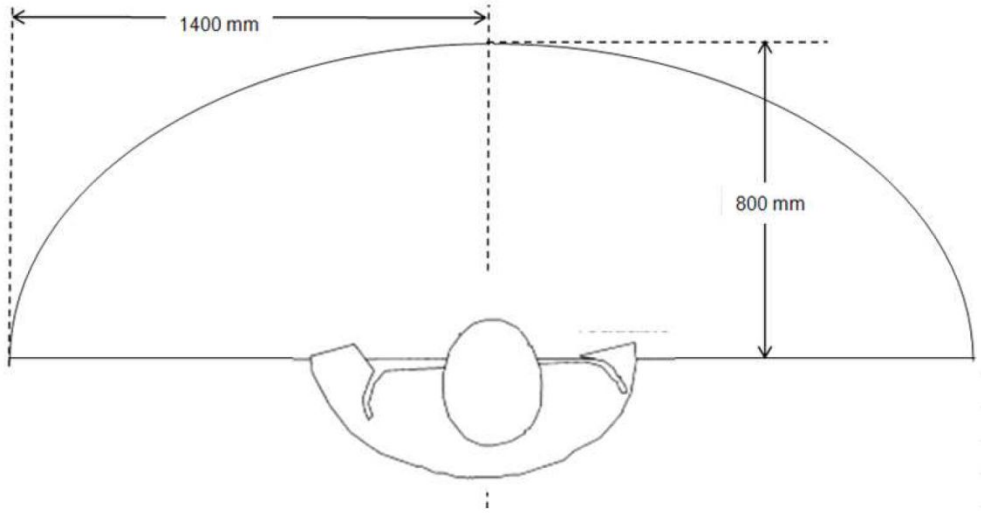


Fig. 14
Area within reach from standing position

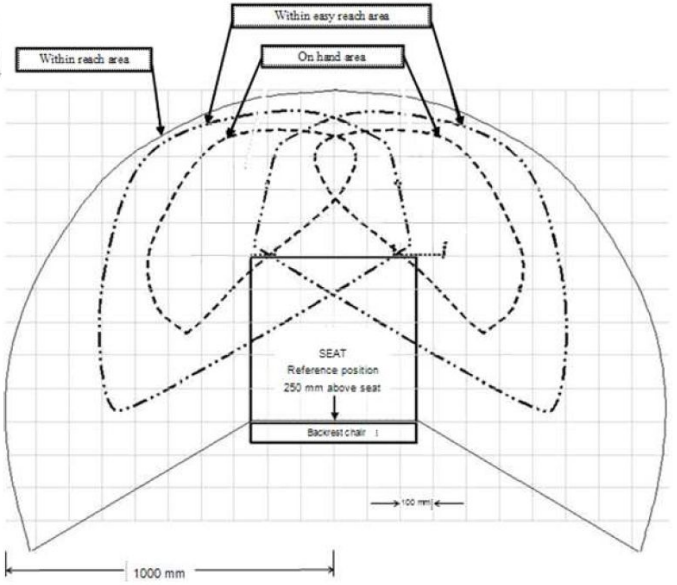
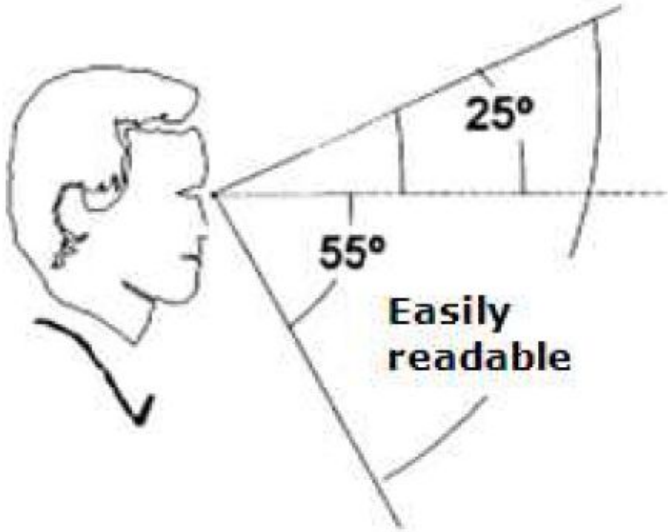


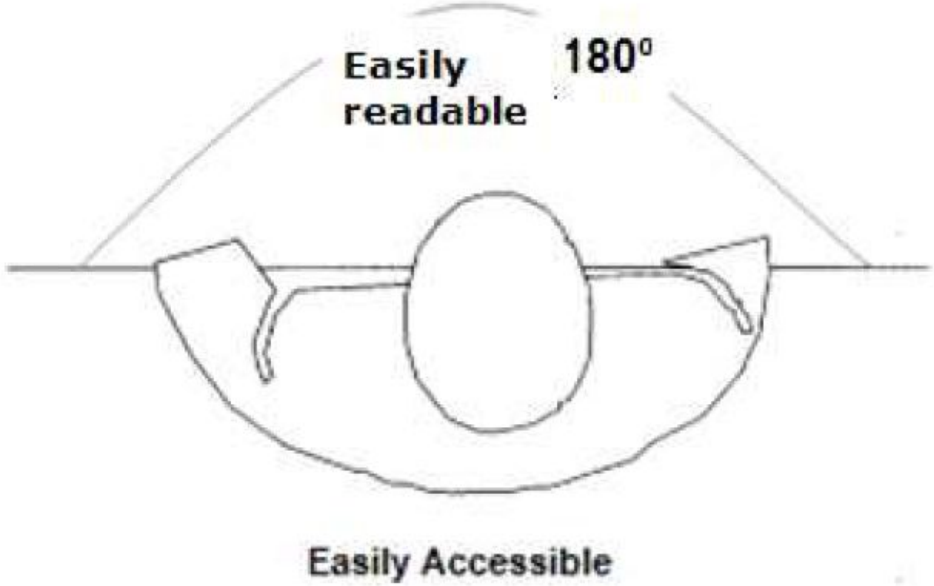
Fig. 15
Areas within reach from seated position

Easily Readable (易於讀取)

- Easily Readable (易於讀取)
  - 視線角度為水平向前180°
  - 垂直上下各為25°和55°
  - 指示器字體高度為距離的3.5倍；字體寬度為高度的0.7 – 0.9倍

Easily Readable (易於讀取)



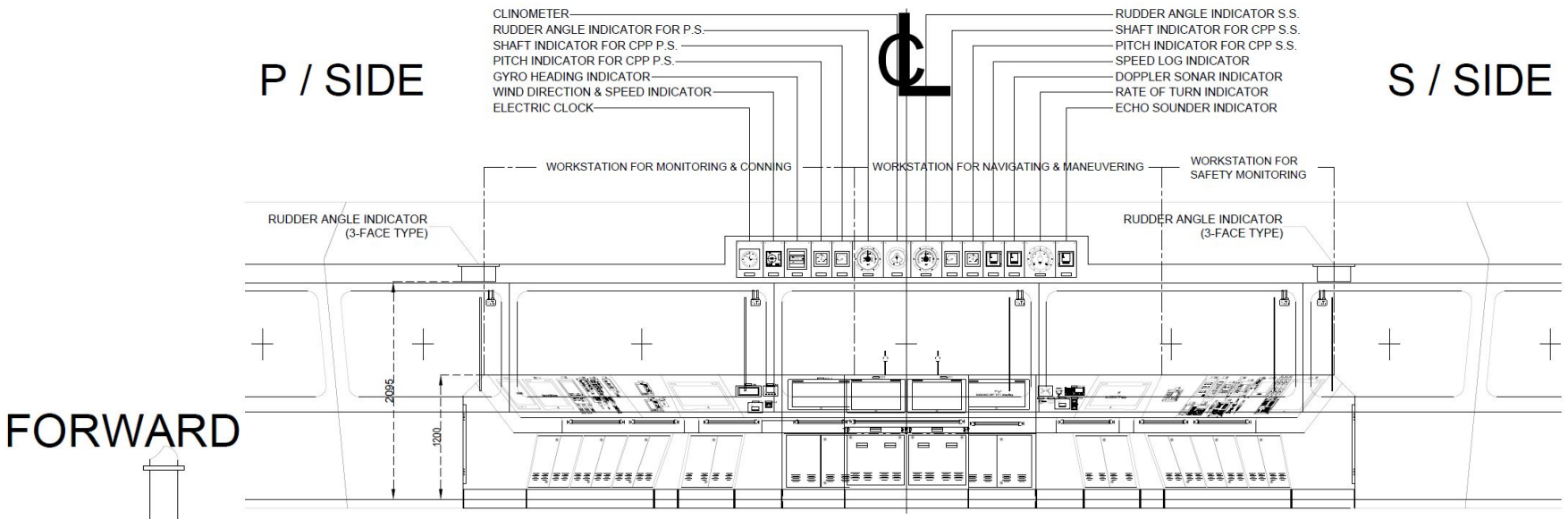


Guidance note 1:

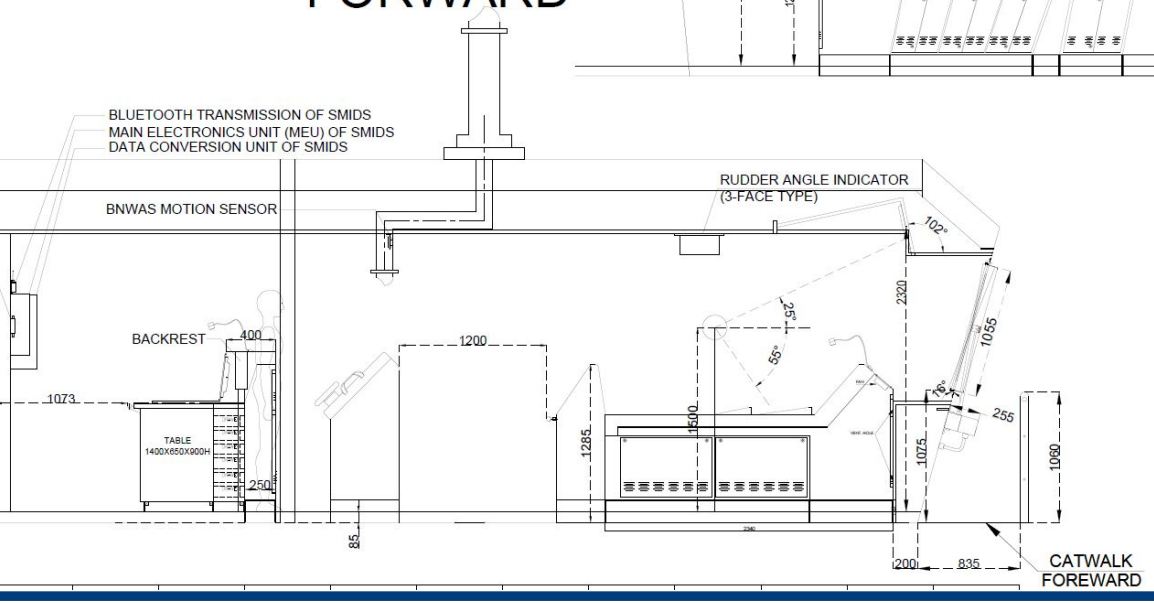
The height of letters and figures in mm should be not less than 3.5 times the reading distance in m. Pertinent character width should be approximately 0.7 to 0.9 times the character height, e.g.:

- Letter height for reading distance 2 m: $2 \times 3.5 = 7$ mm
- Letter width for character height 7 mm: $7 \times 0.7(0.9) = 4.9$ to 6.3 mm
- Resulting minimum letter size: 7 mm × 5 mm.

Easily Readable (易於讀取)



FORWARD



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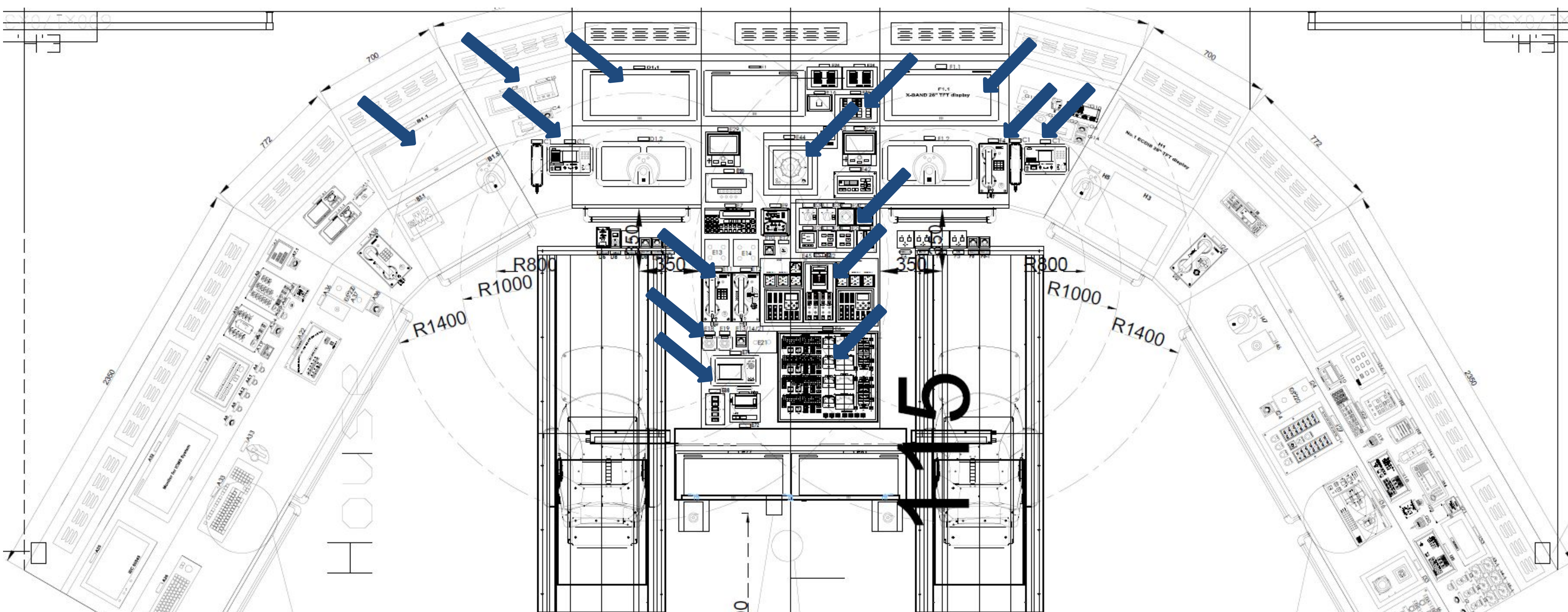
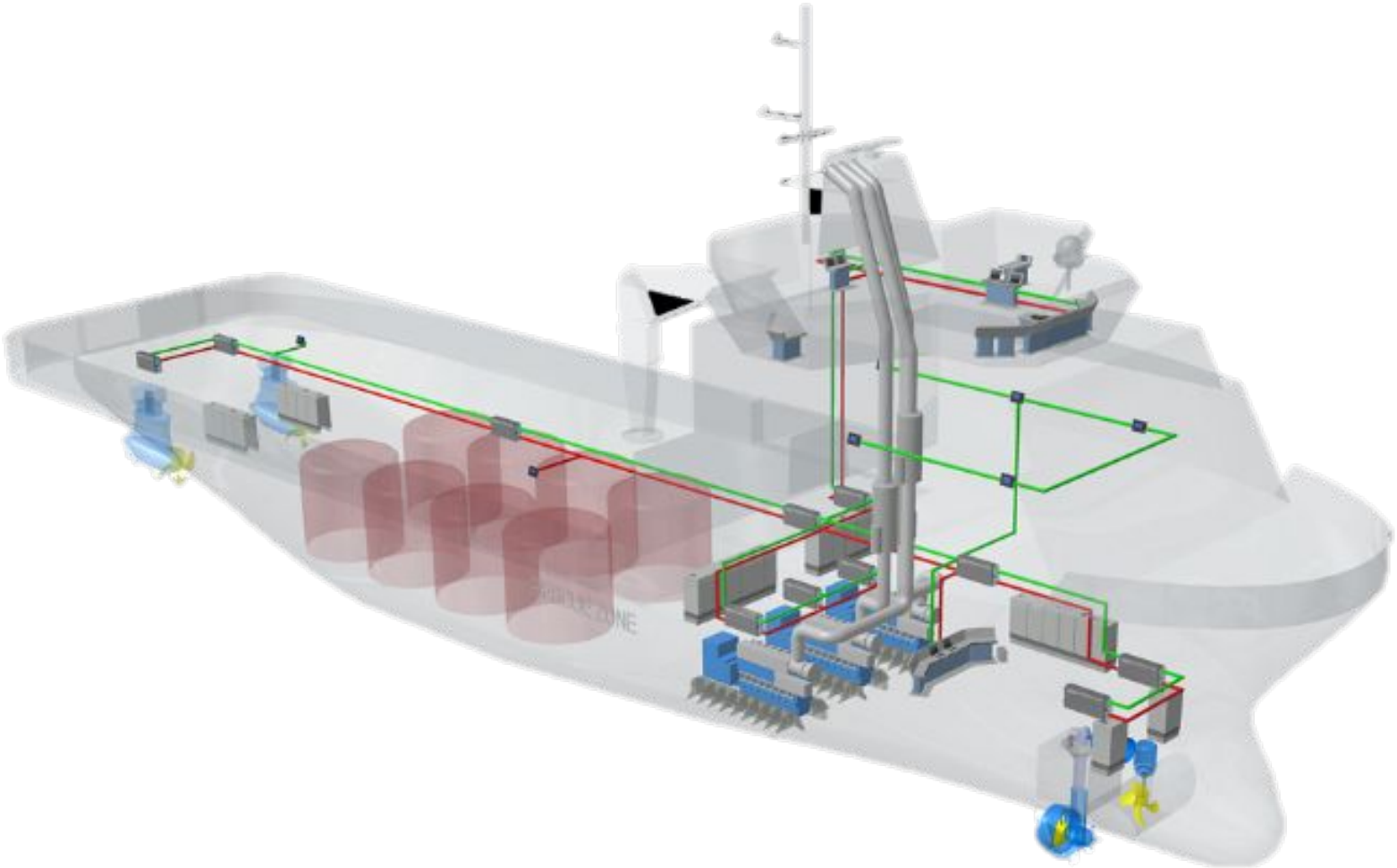
駕駛台佈置實例



(Workstation for Monitoring)	
From Seated Position	ECDIS VHF
From Standing Position	(Speed Log) NAVTEX
Easily Readable	(Echo Sounder) RPM/Pitch…

(Workstation for Navigating & Manoeuvring)	
From Seated Position	VHF …
From Standing Position	
Easily Readable	RPM/Pitch…

整合監控系統
(Integrated Control & Monitor System)



整合監控系統架構

- 監控系統 =

  控(自動控制或手動控制)

  +

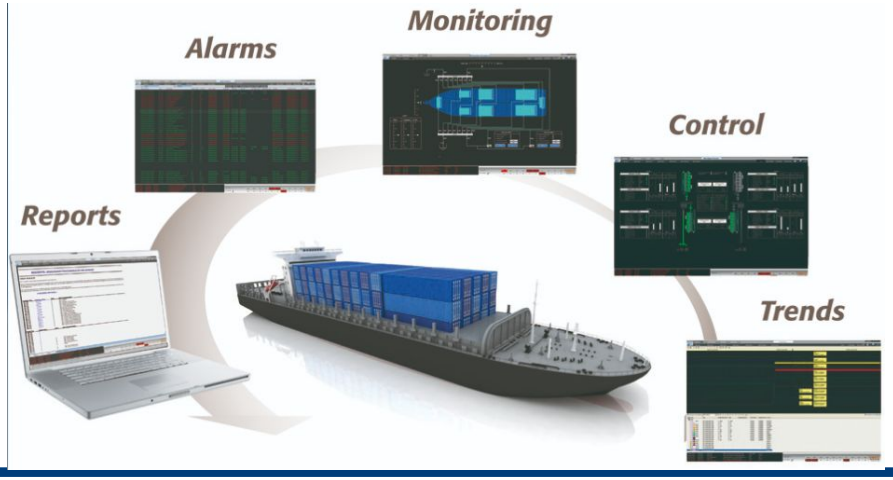
  監(聽到Alarm+看到Display)

  +

  安全及緊急停止

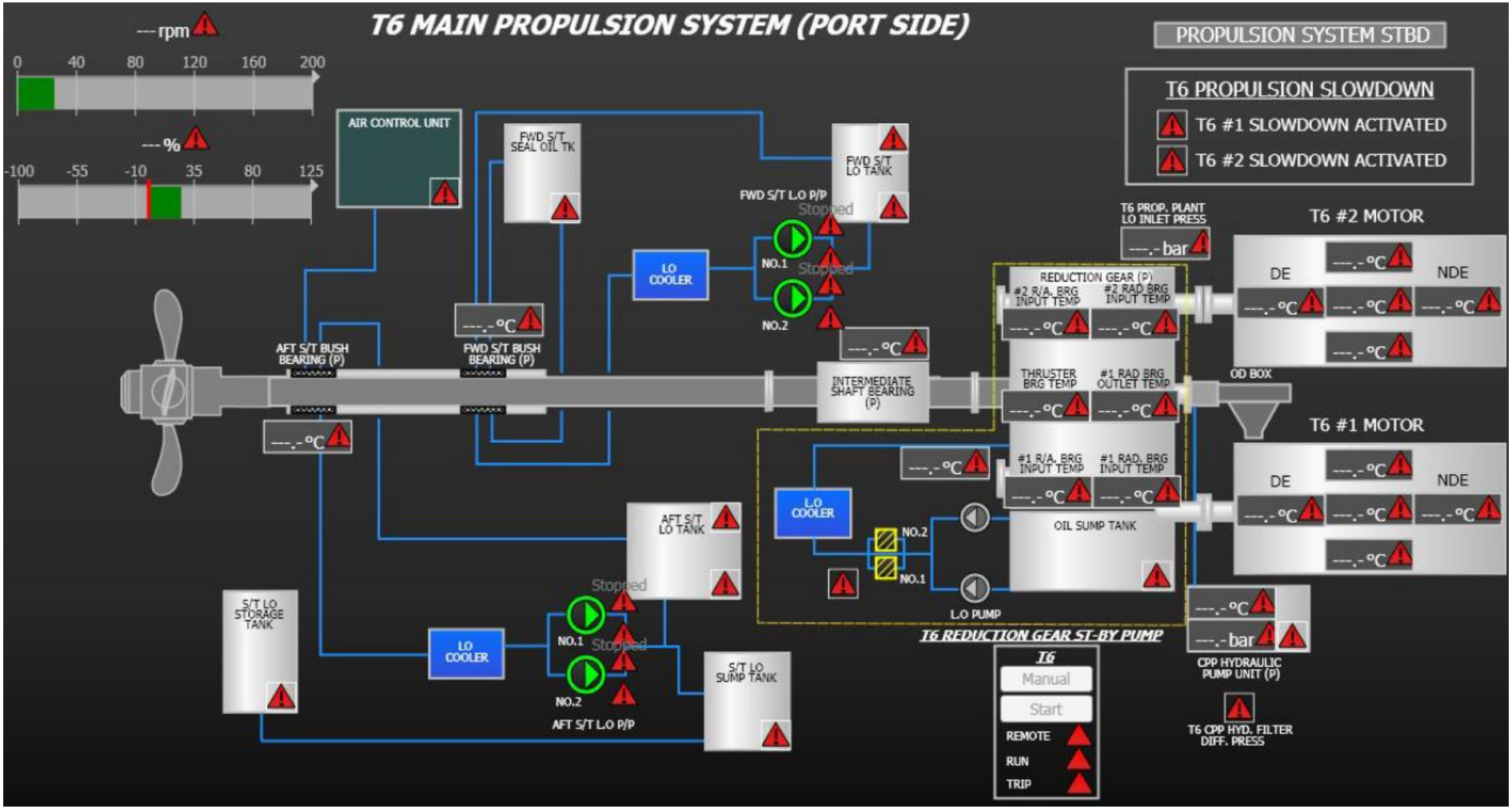
整合監控系統架構

- 檢測器(Detector)
- 執行器(Actuators)
- 信號整合工作站(Process Station)
- 輸出入信號單元(I/O Sender Box)
- 監控系統通信介面



台灣國際造船股份公司
CSBC CORPORATION,TAIWAN

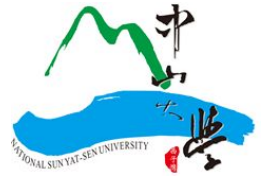
整合監控系統架構


T6 MAIN PROPULSION SYSTEM (PORT SIDE)
PROPULSION SYSTEM STBD
T6 PROPULSION SLOWDOWN
T6 #1 SLOWDOWN ACTIVATED
T6 #2 SLOWDOWN ACTIVATED
---rpm
0 40 80 120 160 200
---%
-100 -55 -10 35 80 125
AIR CONTROL UNIT
FWD S/T SEAL OIL TK
FWD S/T LO TANK
FWD S/T L.O P/P
Stopped
NO.1
NO.2
LO COOLER
AFT S/T BUSH BEARING (P)
FWD S/T BUSH BEARING (P)
INTERMEDIATE SHAFT BEARING (P)
T6 PROP. PLANT LO INLET PRESS
---.- bar
T6 #2 MOTOR
DE
NDE
REDUCTION GEAR (P)
#2 R/A. BRG INPUT TEMP
#2 RAD BRG INPUT TEMP
THRUSTER BRG TEMP
#1 RAD BRG OUTLET TEMP
OD BOX
T6 #1 MOTOR
#1 R/A. BRG INPUT TEMP
#1 RAD. BRG INPUT TEMP
OIL SUMP TANK
L.O PUMP
T6 REDUCTION GEAR ST-BY PUMP
AFT S/T LO TANK
S/T LO STORAGE TANK
S/T LO SUMP TANK
AFT S/T L.O P/P
CPP HYDRAULIC PUMP UNIT (P)
T6 CPP HYD. FILTER DIFF. PRESS
T6
Manual
Start
REMOTE
RUN
TRIP

整合監控系統發展

- 主要目標:主推系統、電力系統、閥系統、機艙監測報警系統...等
- 機艙監測報警系統為實現「無人機艙」的關鍵系統
- 從20世紀50年代船舶自動化已開始發展
  - 單一裝備自動化
  - 集中式系統 (Centralized Control System)
  - 分散行系統 (Distributed Control System)
  - 現場總線式系統 (Fieldbus Control System)

整合監控系統發展



Extension Alarm Groups

- MAIN PROPULSION TRIP/SLD
- MAIN PROPULSION ABNORMAL
- DG TRIP/SLD
- DG ABNORMAL
- T.O.BLR & ECON ABNORMAL
- FIRE
- BILGE HIGH
- OTHERS ABNORMAL
- ELECTRIC POWER SYSTEM ABN
- SYSTEM ALARMS

Communications

- MDG NO.1 INTERFACE
- MDG NO.2 INTERFACE
- MDG NO.3 INTERFACE
- MDG NO.4 INTERFACE
- HDG NO.1 INTERFACE
- HDG NO.2 INTERFACE
- PGS NO.1 GROUP
- PGS NO.2 GROUP
- MAIN PROPUSION (T5-1)
- MAIN PROPUSION (T5-2)
- MAIN PROPUSION (T6-1)
- MAIN PROPUSION (T6-2)
- TANK LEVEL GAUGING SYSTEM
- ICCP
- NO.1 S/G
- NO.2 S/G

Alarm Groups

ALARM GROUP OVERVIEW

- PROPULSION MANEUVERING
- PROPULSION(DRIVE MOTOR)
- PROPULSION(CONVERTER)
- PROPULSION(CPP)
- PROPULSION(R/G)
- BOILER
- ECONOMIZER
- SHAFTING
- EMERGENCY GENERATOR
- GENERATOR ENGINE LO SYS
- GENERATOR ENGINE FO SYS
- NO.1 MAIN GENERATOR SYSTEM
- NO.2 MAIN GENERATOR SYSTEM
- NO.3 MAIN GENERATOR SYSTEM
- NO.4 MAIN GENERATOR SYSTEM
- HARBOUR GEN. ENGINE SYSTEM
- HARBOUR GEN. SYSTEM
- F.O TRANSFER&PURIFYING SYS
- L.O TRANSFER&PURIFYING SYS
- AIR SYSTEM
- FRESH WATER SYSTEM
- SW, BILGE&BALLAST SYSTEM
- VENTILATION
- STEERING GEAR
- SIDE THRUSTER SYSTEM
- FIRE AND OTHERS
- WATER TIGHT HATCH

HARBOUR MODE — When Harbour mode selected WTD and WTH alarm will be inhibited automatically.

Mimics

POWER PLANT
- POWER PLANT OVERVIEW
- POWER PLANT ALARMS
- NO1 MAIN DG SYSTEM
- NO2 MAIN DG SYSTEM
- NO3 MAIN DG SYSTEM
- NO4 MAIN DG SYSTEM
- NO1 HARBOUR GE
- NO2 HARBOUR GE

PROPULSION SYSTEM
- MAIN PROPUSION SYSTEM ALARMS
- SIDE THRUST SYSTEM ALARMS
- PROPULSION SYSTEM PORT
- PROPULSION SYSTEM STBD

FO SYSTEM
- PORT FO SUPPLY SYSTEM
- STBD FO SUPPLY SYSTEM
- PORT FO TRANSFER SYSTEM
- STBD FO TRANSFER SYSTEM
- PURIFIERS SYSTEM

LO SYSTEM
- PORT ST LO SYSTEM
- STBD ST LO SYSTEM

COOLING WATER SYSTEM
- PORT ER CENTRAL CFW SYSTEM
- STBD ER CENTRAL CFW SYSTEM
- PORT MDG CFW SYSTEM
- STBD MDG CFW SYSTEM
- PORT PROPULSION ROOM CFW SYSTEM
- STBD PROPULSION ROOM CFW SYSTEM
- BOW THRUSTER CFW SYSTEM
- BOW THRUSTER CSW SYSTEM

AIR SYSTEM
- PORT START CONTROL AIR SYSTEM
- STBD START CONTRIL AIR SYSTEM

THERMAL OIL SYSTEM
- THERMAL OIL SYSTEM PORT
- THERMAL OIL SYSTEM ST'BD

PUMP & FAN SYSTEM
- STANDBY PUMP CONTROL SYSTEM
- PUMP&FAN CONTROL SYSTEM

WATER TIGHT SYSTEM
- 1 PLATFORM FORE & UPPER DECK
- D & E DECK WTH
- PARTIAL & A DECK WTD
- PLATFORM
- TOWER TOP (P&S SIDE)
- UPPER & UNDER UPPER
- UPPER DECK&1 PLATFORM WTH

BALLAST WATER SYSTEM
- BALLAST PUMP SYSTEM ALARMS
- BALLAST SYSTEM FWD
- BALLAST SYSTM AFT
- STRIPPING SYSTEM
- VENT SYSTEM

TANKS
- BALLAST TANKS 1
- BALLAST TANKS 2
- BALLAST TANKS 3 & FUEL TANKS

RUNNING HOURS
- RUNNING HOURS 1
- RUNNING HOURS 2

Monitoring System

- FPD 1
- FPD 2
- FPD 3
- FPD 4
- FPD 5
- FPD 6
- FPD 7
- FPD 8
- FPD 9

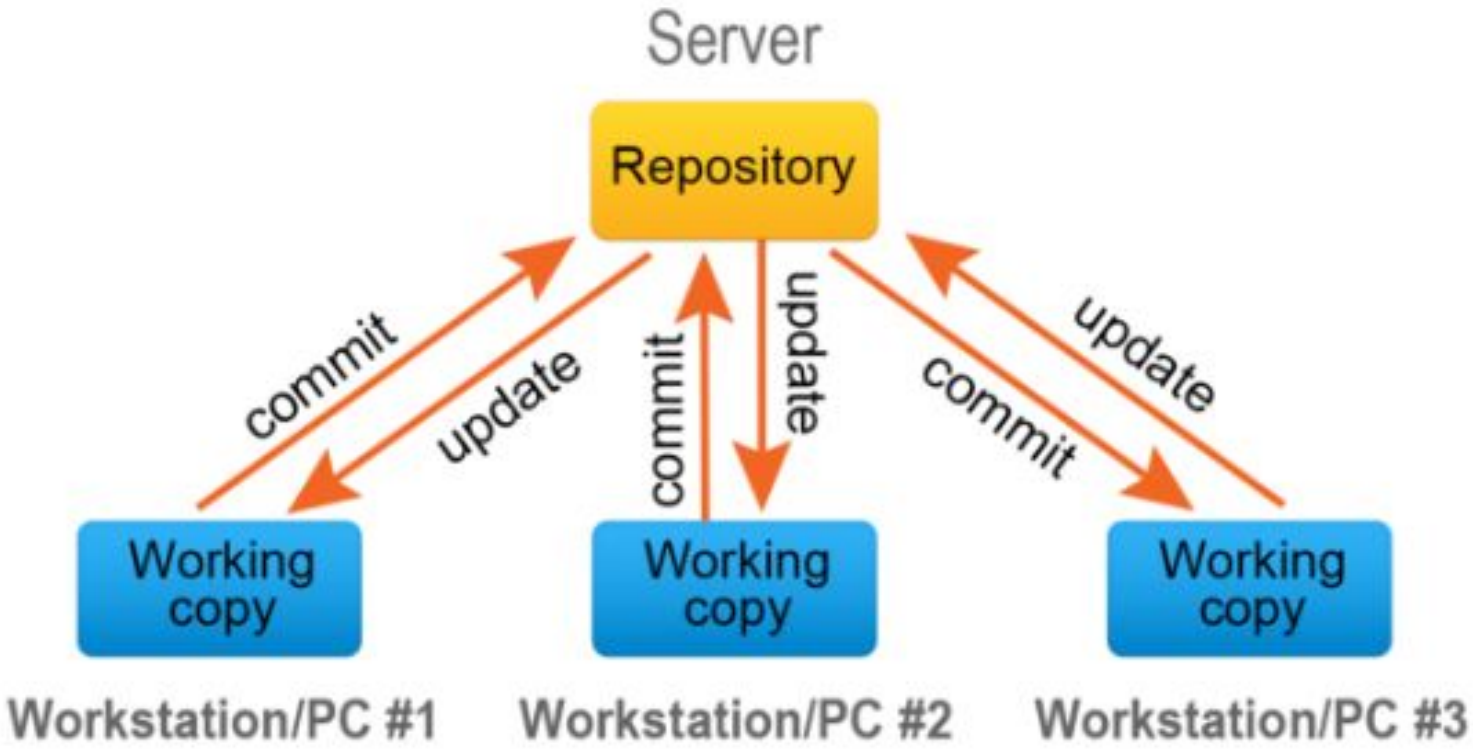
SYSTEM CONFIGURATION

整合監控系統發展

- 集中式系統
  - 20世紀60年代開始發展(日本、丹麥)
  - 將所有需監控的信號傳送至監控室
  - 大多使用4-20mA的類比信號，易受干擾
  - 鋪設大量屏蔽電纜，系統造價昂貴
  - 主系統損壞，整個系統都將癱瘓

整合監控系統發展

Centralized version control

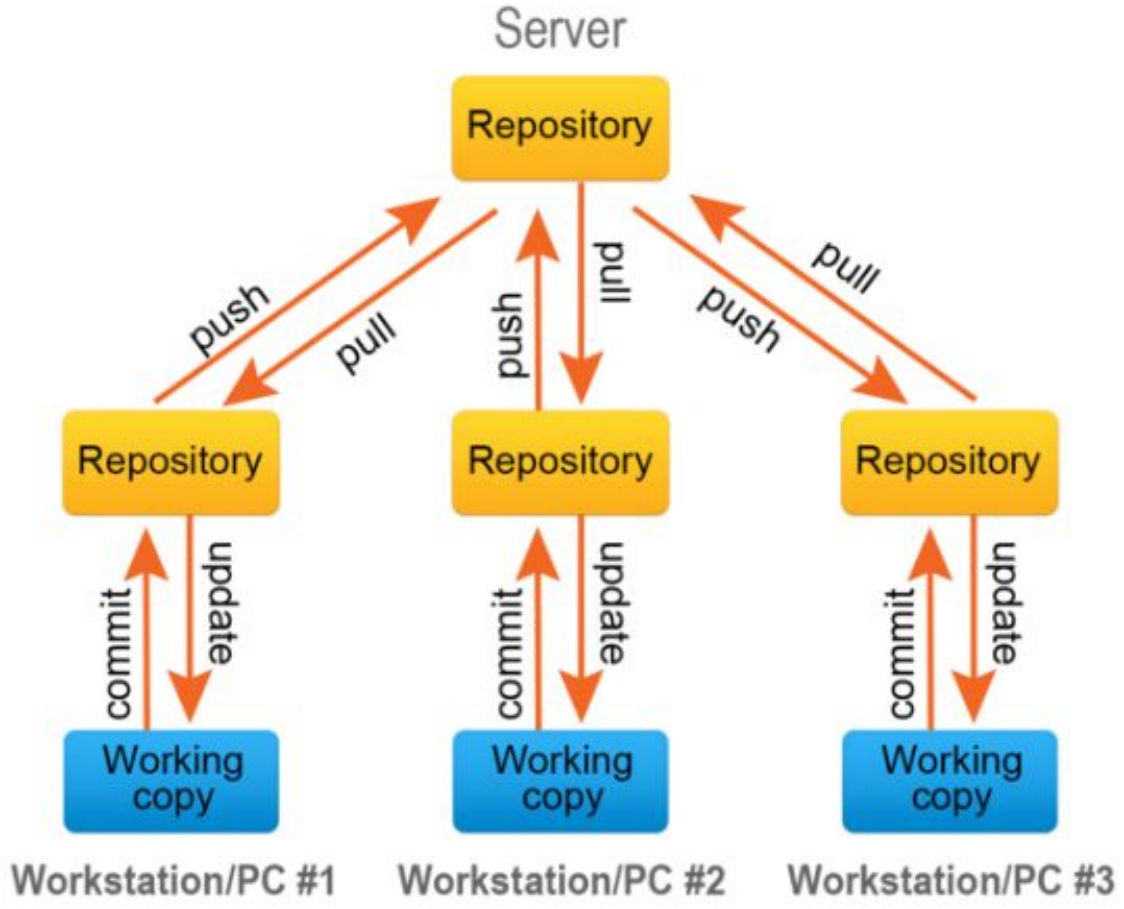


整合監控系統發展

- 分散式系統
  - 1975年美國Honeywell推出第一套分散式控制系統
  - 由多台控制器取代一台電腦執行監控任務
  - 使用網路通信連結各控制系統
  - 各廠家系統不同標準，無法輕易擴展結合其他系統

整合監控系統發展

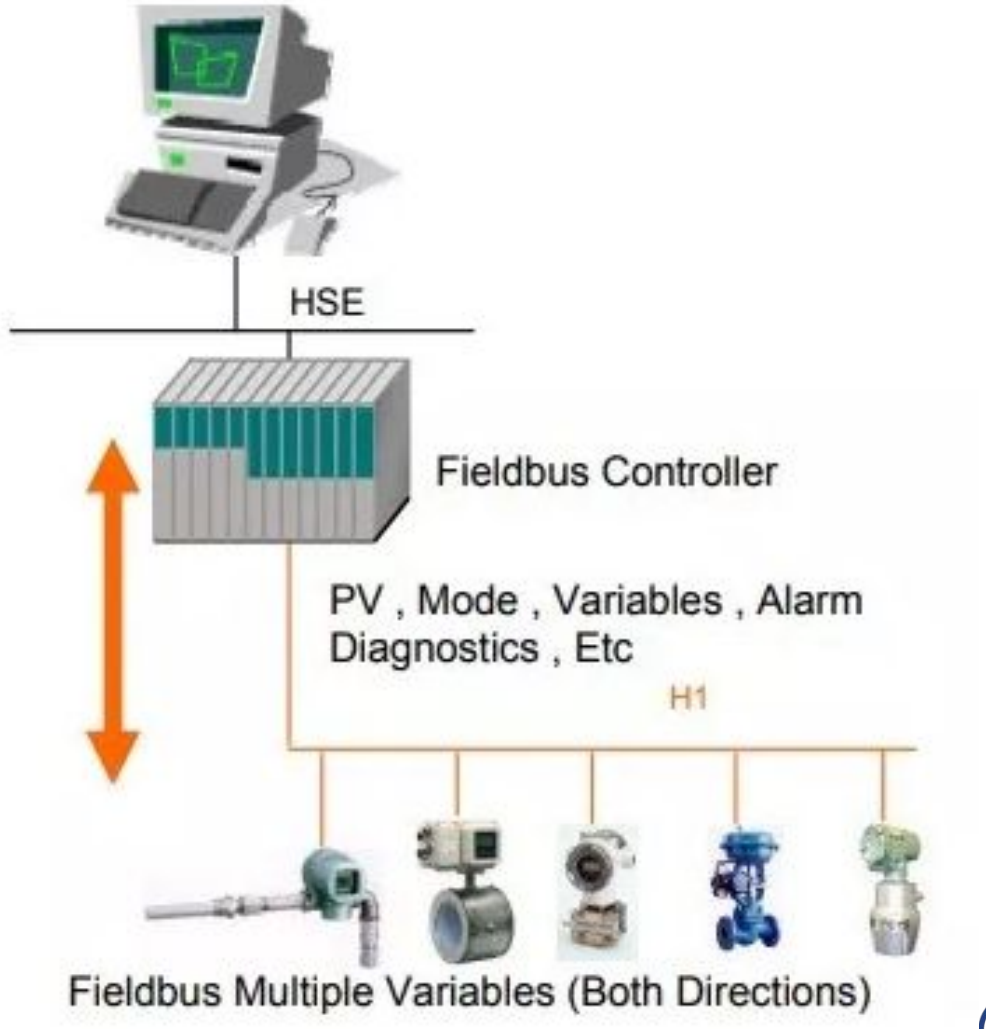
Distributed version control



整合監控系統發展

- 現場總線式(Fieldbus)系統
  - 20世紀80年代開始發展，90年代引入船舶工業
  - 將各種偵測器、控制器信號接至現場總線系統
  - 系統全數位通訊、高度分散性、開放式系統相容性高

整合監控系統發展


HSE
Fieldbus Controller
PV , Mode , Variables , Alarm
Diagnostics , Etc
H1
Fieldbus Multiple Variables (Both Directions)

整合監控系統功能

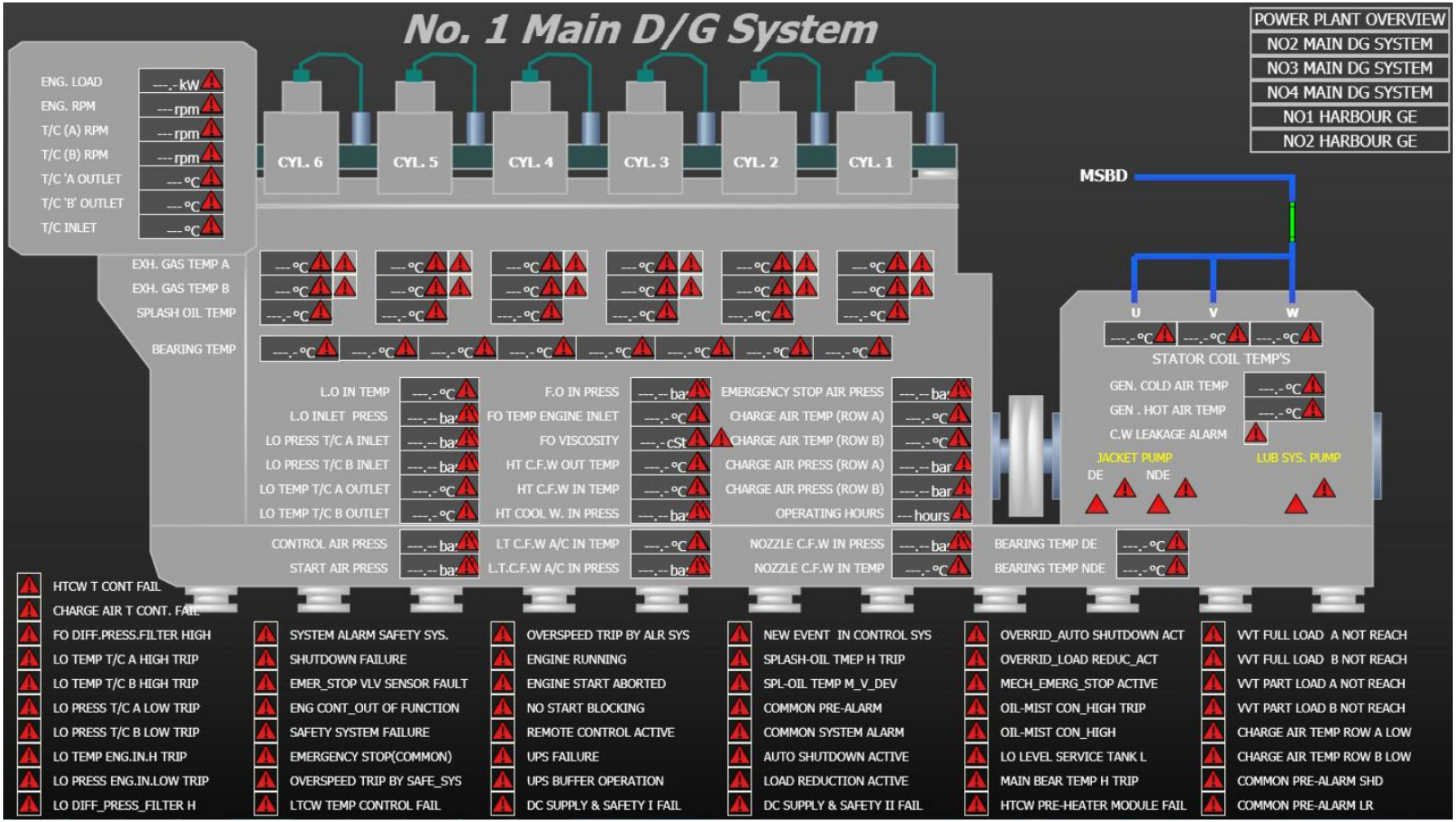
- 監視報警系統最少應具有以下功能
  - 聲光警報
  - 參數與狀態顯示
  - 報警列印
  - 報警延時
  - 報警隱蔽
  - 延伸報警

整合監控系統功能

- 聲光警報
  - 因監測點發生異常，系統自動發出聲光警報

- 參數與狀態顯示
  - 透過模擬儀表(Mimic)或是電腦螢幕顯示監測點的參數

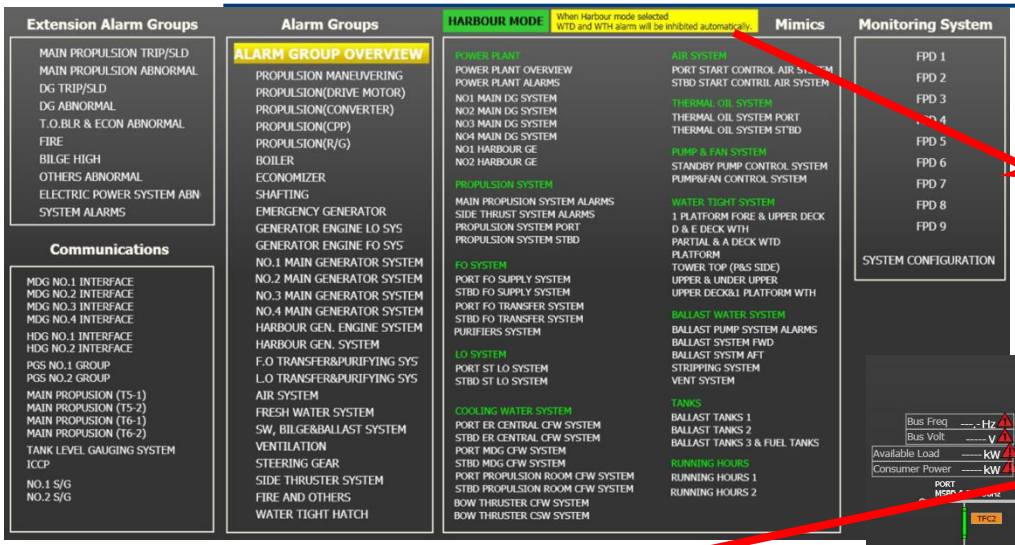
整合監控系統功能

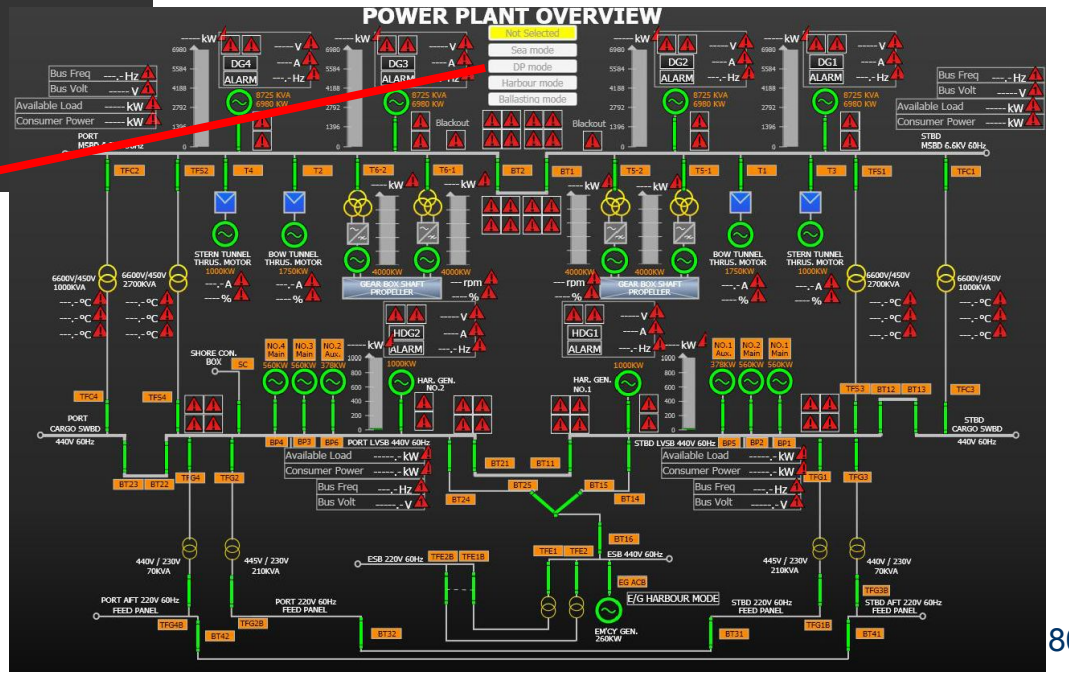

No. 1 Main D/G System
POWER PLANT OVERVIEW
NO2 MAIN DG SYSTEM
NO3 MAIN DG SYSTEM
NO4 MAIN DG SYSTEM
NO1 HARBOUR GE
NO2 HARBOUR GE
ENG. LOAD
ENG. RPM
T/C (A) RPM
T/C (B) RPM
T/C 'A OUTLET
T/C 'B' OUTLET
T/C INLET
CYL. 6
CYL. 5
CYL. 4
CYL. 3
CYL. 2
CYL. 1
MSBD
EXH. GAS TEMP A
EXH. GAS TEMP B
SPLASH OIL TEMP
BEARING TEMP
STATOR COIL TEMP'S
GEN. COLD AIR TEMP
GEN . HOT AIR TEMP
C.W LEAKAGE ALARM
JACKET PUMP
LUB SYS. PUMP
DE
NDE
L.O IN TEMP
L.O INLET PRESS
LO PRESS T/C A INLET
LO PRESS T/C B INLET
LO TEMP T/C A OUTLET
LO TEMP T/C B OUTLET
F.O IN PRESS
FO TEMP ENGINE INLET
FO VISCOSITY
HT C.F.W OUT TEMP
HT C.F.W IN TEMP
HT COOL W. IN PRESS
EMERGENCY STOP AIR PRESS
CHARGE AIR TEMP (ROW A)
CHARGE AIR TEMP (ROW B)
CHARGE AIR PRESS (ROW A)
CHARGE AIR PRESS (ROW B)
OPERATING HOURS
CONTROL AIR PRESS
START AIR PRESS
LT C.F.W A/C IN TEMP
L.T.C.F.W A/C IN PRESS
NOZZLE C.F.W IN PRESS
NOZZLE C.F.W IN TEMP
BEARING TEMP DE
BEARING TEMP NDE
HTCW T CONT FAIL
CHARGE AIR T CONT. FAIL
FO DIFF.PRESS.FILTER HIGH
LO TEMP T/C A HIGH TRIP
LO TEMP T/C B HIGH TRIP
LO PRESS T/C A LOW TRIP
LO PRESS T/C B LOW TRIP
LO TEMP ENG.IN.H TRIP
LO PRESS ENG.IN.LOW TRIP
LO DIFF_PRESS_FILTER H
SYSTEM ALARM SAFETY SYS.
SHUTDOWN FAILURE
EMER_STOP VLV SENSOR FAULT
ENG CONT_OUT OF FUNCTION
SAFETY SYSTEM FAILURE
EMERGENCY STOP(COMMON)
OVERSPEED TRIP BY SAFE_SYS
LTCW TEMP CONTROL FAIL
OVERSPEED TRIP BY ALR SYS
ENGINE RUNNING
ENGINE START ABORTED
NO START BLOCKING
REMOTE CONTROL ACTIVE
UPS FAILURE
UPS BUFFER OPERATION
DC SUPPLY & SAFETY I FAIL
NEW EVENT IN CONTROL SYS
SPLASH-OIL TMEP H TRIP
SPL-OIL TEMP M_V_DEV
COMMON PRE-ALARM
COMMON SYSTEM ALARM
AUTO SHUTDOWN ACTIVE
LOAD REDUCTION ACTIVE
DC SUPPLY & SAFETY II FAIL
OVERRID_AUTO SHUTDOWN ACT
OVERRID_LOAD REDUC_ACT
MECH_EMERG_STOP ACTIVE
OIL-MIST CON_HIGH TRIP
OIL-MIST CON_HIGH
LO LEVEL SERVICE TANK L
MAIN BEAR TEMP H TRIP
HTCW PRE-HEATER MODULE FAIL
VVT FULL LOAD A NOT REACH
VVT FULL LOAD B NOT REACH
VVT PART LOAD A NOT REACH
VVT PART LOAD B NOT REACH
CHARGE AIR TEMP ROW A LOW
CHARGE AIR TEMP ROW B LOW
COMMON PRE-ALARM SHD
COMMON PRE-ALARM LR

整合監控系統功能

- 報警列印
  - 報警發生時，系統自動列印報警名稱、內容以及時間
- 報警延時
  - 根據監測的目標不同，訂定不同的報警延遲時間，避免誤動作
- 報警隱蔽
  - 根據船舶的狀態，隱蔽不必要的警報

整合監控系統功能


Extension Alarm Groups
MAIN PROPULSION TRIP/SLD
MAIN PROPULSION ABNORMAL
DG TRIP/SLD
DG ABNORMAL
T.O.BLR & ECON ABNORMAL
FIRE
BILGE HIGH
OTHERS ABNORMAL
ELECTRIC POWER SYSTEM ABN
SYSTEM ALARMS
Communications
MDG NO.1 INTERFACE
MDG NO.2 INTERFACE
MDG NO.3 INTERFACE
MDG NO.4 INTERFACE
HDG NO.1 INTERFACE
HDG NO.2 INTERFACE
PGS NO.1 GROUP
PGS NO.2 GROUP
MAIN PROPUSION (T5-1)
MAIN PROPUSION (T5-2)
MAIN PROPUSION (T6-1)
MAIN PROPUSION (T6-2)
TANK LEVEL GAUGING SYSTEM
ICCP
NO.1 S/G
NO.2 S/G
Alarm Groups
ALARM GROUP OVERVIEW
PROPULSION MANEUVERING
PROPULSION(DRIVE MOTOR)
PROPULSION(CONVERTER)
PROPULSION(CPP)
PROPULSION(R/G)
BOILER
ECONOMIZER
SHAFTING
EMERGENCY GENERATOR
GENERATOR ENGINE LO SYS
GENERATOR ENGINE FO SYS
NO.1 MAIN GENERATOR SYSTEM
NO.2 MAIN GENERATOR SYSTEM
NO.3 MAIN GENERATOR SYSTEM
NO.4 MAIN GENERATOR SYSTEM
HARBOUR GEN. ENGINE SYSTEM
HARBOUR GEN. SYSTEM
F.O TRANSFER&PURIFYING SYS
L.O TRANSFER&PURIFYING SYS
AIR SYSTEM
FRESH WATER SYSTEM
SW, BILGE&BALLAST SYSTEM
VENTILATION
STEERING GEAR
SIDE THRUSTER SYSTEM
FIRE AND OTHERS
WATER TIGHT HATCH
HARBOUR MODE
When Harbour mode selected
WTD and WTH alarm will be inhibited automatically.
Mimics
POWER PLANT
POWER PLANT OVERVIEW
POWER PLANT ALARMS
NO1 MAIN DG SYSTEM
NO2 MAIN DG SYSTEM
NO3 MAIN DG SYSTEM
NO4 MAIN DG SYSTEM
NO1 HARBOUR GE
NO2 HARBOUR GE
PROPULSION SYSTEM
MAIN PROPUSION SYSTEM ALARMS
SIDE THRUST SYSTEM ALARMS
PROPULSION SYSTEM PORT
PROPULSION SYSTEM STBD
FO SYSTEM
PORT FO SUPPLY SYSTEM
STBD FO SUPPLY SYSTEM
PORT FO TRANSFER SYSTEM
STBD FO TRANSFER SYSTEM
PURIFIERS SYSTEM
LO SYSTEM
PORT ST LO SYSTEM
STBD ST LO SYSTEM
COOLING WATER SYSTEM
PORT ER CENTRAL CFW SYSTEM
STBD ER CENTRAL CFW SYSTEM
PORT MDG CFW SYSTEM
STBD MDG CFW SYSTEM
PORT PROPULSION ROOM CFW SYSTEM
STBD PROPULSION ROOM CFW SYSTEM
BOW THRUSTER CFW SYSTEM
BOW THRUSTER CSW SYSTEM
AIR SYSTEM
PORT START CONTROL AIR SYSTEM
STBD START CONTRIL AIR SYSTEM
THERMAL OIL SYSTEM
THERMAL OIL SYSTEM PORT
THERMAL OIL SYSTEM STBD
PUMP & FAN SYSTEM
STANDBY PUMP CONTROL SYSTEM
PUMP&FAN CONTROL SYSTEM
WATER TIGHT SYSTEM
1 PLATFORM FORE & UPPER DECK
D & E DECK WTH
PARTIAL & A DECK WTD
PLATFORM
TOWER TOP (P&S SIDE)
UPPER & UNDER UPPER
UPPER DECK&1 PLATFORM WTH
BALLAST WATER SYSTEM
BALLAST PUMP SYSTEM ALARMS
BALLAST SYSTEM FWD
BALLAST SYSTM AFT
STRIPPING SYSTEM
VENT SYSTEM
TANKS
BALLAST TANKS 1
BALLAST TANKS 2
BALLAST TANKS 3 & FUEL TANKS
RUNNING HOURS
RUNNING HOURS 1
RUNNING HOURS 2
Monitoring System
FPD 1
FPD 2
FPD 3
FPD 4
FPD 5
FPD 6
FPD 7
FPD 8
FPD 9
SYSTEM CONFIGURATION

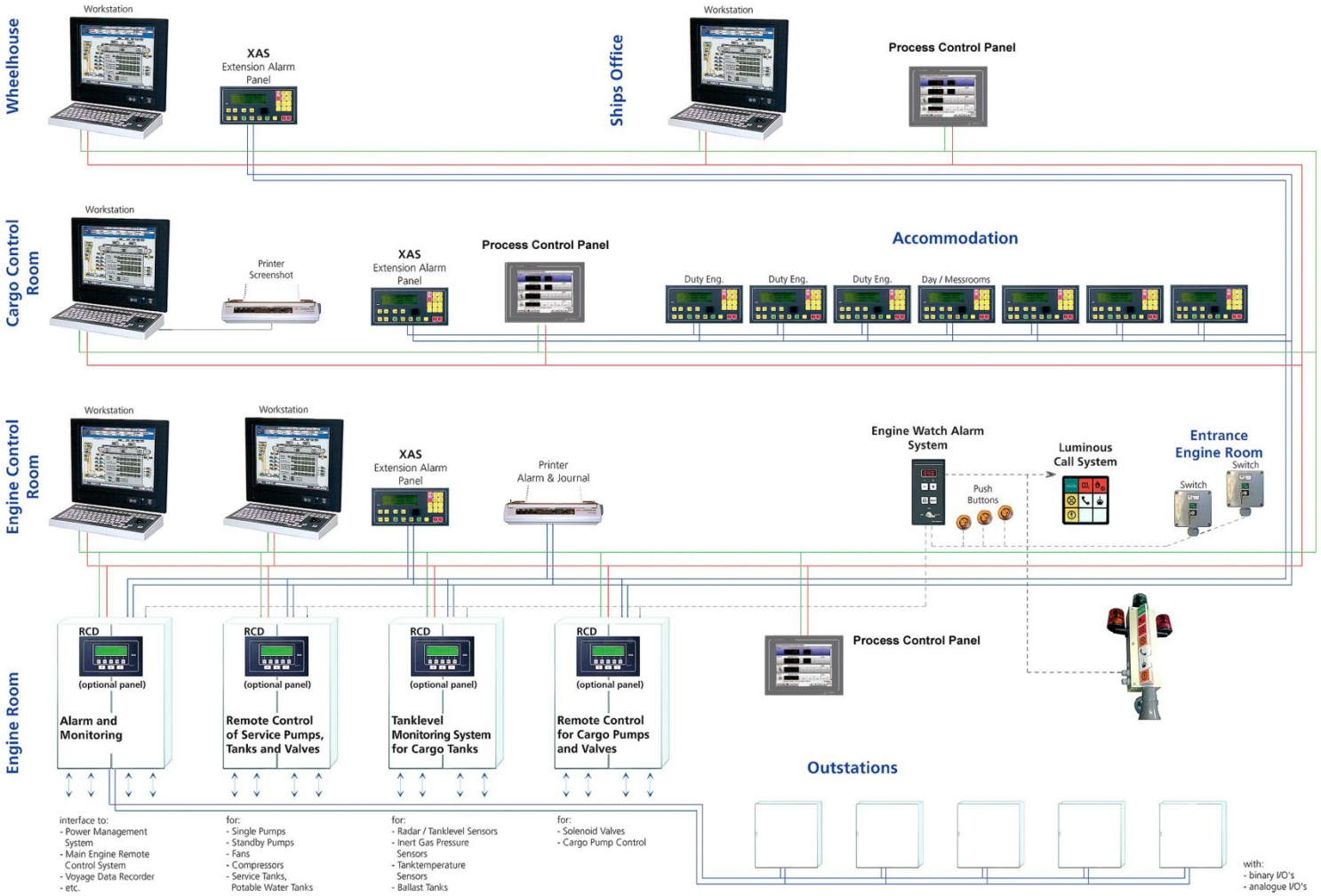

POWER PLANT OVERVIEW
Not Selected
Sea mode
DP mode
Harbour mode
Ballasting mode
DG4
DG3
DG2
DG1
HDG2
HDG1
STERN TUNNEL THRUS. MOTOR
BOW TUNNEL THRUS. MOTOR
GEAR BOX SHAFT PROPELLER
SHORE CON. BOX
HAR. GEN. NO.2
HAR. GEN. NO.1
PORT LVSB 440V 60Hz
STBD LVSB 440V 60Hz
PORT CARGO SWBD 440V 60Hz
STBD CARGO SWBD 440V 60Hz
STBD MSBD 6.6KV 60Hz
ESB 220V 60Hz
ESB 440V 60Hz
E/G HARBOUR MODE
EMCY GEN. 250KW
PORT AFT 220V 60Hz FEED PANEL
PORT 220V 60Hz FEED PANEL
STBD 220V 60Hz FEED PANEL
STBD AFT 220V 60Hz FEED PANEL


Not Selected
Sea mode
DP mode
Harbour mode
Ballasting mode

整合監控系統功能

- 延伸報警
  - 因無人機艙而設置
  - 將機艙裝備故障報警傳送至駕駛台、公共場所、輪機長及值班輪機員住所

整合監控系統功能


Wheelhouse
Workstation
XAS
Extension Alarm
Panel
Ships Office
Workstation
Process Control Panel
Cargo Control
Room
Workstation
Printer
Screenshot
XAS
Extension Alarm
Panel
Process Control Panel
Accommodation
Duty Eng.
Duty Eng.
Duty Eng.
Day / Messrooms
Engine Control
Room
Workstation
Workstation
XAS
Extension Alarm
Panel
Printer
Alarm & Journal
Engine Watch Alarm
System
Push
Buttons
Luminous
Call System
Entrance
Engine Room
Switch
Switch
Engine Room
RCD
(optional panel)
Alarm and
Monitoring
RCD
(optional panel)
Remote Control
of Service Pumps,
Tanks and Valves
RCD
(optional panel)
Tanklevel
Monitoring System
for Cargo Tanks
RCD
(optional panel)
Remote Control
for Cargo Pumps
and Valves
Process Control Panel
Outstations
interface to:
- Power Management
System
- Main Engine Remote
Control System
- Voyage Data Recorder
- etc.
for:
- Single Pumps
- Standby Pumps
- Fans
- Compressors
- Service Tanks,
Potable Water Tanks
for:
- Radar / Tanklevel Sensors
- Inert Gas Pressure
Sensors
- Tanktemperature
Sensors
- Ballast Tanks
for:
- Solenoid Valves
- Cargo Pump Control
with:
- binary I/O's
- analogue I/O's


Q&A


Be a Pilot in Ocean
CSBC