Anthropometry of Offshore Personnel

Statistical Analysis of the Weight of UK Offshore Workers

CityPort Oil & Gas Services

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EXECUTIVE SUMMARY

The weight and size of offshore energy workers in the UK sector is increasing, which impacts adversely on the design and operation of key offshore equipment including escape and evacuation systems. Lifeboats and liferafts are recognised as Safety and Environmentally Critical Elements (SECEs) that are installed on every UK offshore installation and must be fit for purpose.

The maximum passenger capacity of lifeboats and liferafts is adversely affected by increases in the average weight of the offshore population. This report focusses on the impacts upon evacuation systems associated with the increasing weight of offshore personnel. The assessment of associated issues related to the increasing size of offshore personnel will be addressed separately.

Statistical reprocessing of the Vantage-POB weight data for the 2022 UK population of offshore workers has been completed as part of the preparation of this report. The processing of the data confirms that the average weight of UK offshore workers in 2022 was approximately 96.56kg and the standard deviation for the offshore population was 15.59kg. This represents an increase of about 10kg in the average weight of offshore personnel since 2008, which is significant. Analysis of additional offshore weight data provided by CPOGS clients confirms the observed trend in weight gain to be relevant and valid.

In order to ensure that the risk of overloading a lifeboat is minimal, lifeboats are typically designed using a calculated ‘design weight’ per person. The design weight is always higher than the average weight of the whole parent population of offshore workers and it allows for the natural variation in the total weight of the smaller group of personnel randomly allocated to the lifeboat. In 2008, the design weight for lifeboat evaluation recommended by the UK HSE in OIS 12/2008 was 98kg. This design weight value was much higher than the average weight of the offshore population at the time, which was 87kg.

A recognised methodology for calculating updated design weights in 2024 for both new and existing lifeboats is described in this report to assist Duty Holders. The methodology is based on the standard design weight approach followed by the MCA and other marine bodies for lifeboat design.

The design weight for lifeboats is known to vary in relation to the nominal passenger capacity of the lifeboat, which is the marine equivalent of the ‘small aeroplane’ problem in the aviation industry. Therefore, it may be beneficial to Duty Holders to conduct their own design weight calculations to accurately reflect their existing lifeboat provisions on their own installations.

Using the design weight methodology described in this report, a range of practical lifeboat design weights are proposed in Table 1.1 for consideration by stakeholders, based on five different nominal lifeboat sizes that are currently deployed in the North Sea.

Table 1.1 – Advisory Lifeboat Design Weights Based on a Forward Weight Trend Projection to 2027.

Baseline Worker Statistics		Advisory Lifeboat Design Weight (Kg)				
Reference Year	Projected Average Worker Weight (kg)	POB of 15 to 24	POB of 25 to 49	POB of 50 to 74	POB of 75 to 100	POB of 100+
2027	99.97	112.40	110.73	109.04	108.29	107.84

It is probable that the trend in increasing average offshore weight may continue, at least in the short term. Therefore, the lifeboat design weights presented in Table 1.1 have been extrapolated forward by five years from the 2022 reference data to 2027 to provide assurance that lifeboats that comply will remain within the required confidence interval. The forward extrapolation will help reduce the need for frequent re-evaluation of lifeboat capacity by Duty Holders.

It should also be noted that the design weights presented in Table 1.1 above assume the weight of the mandatory PPE worn by offshore workers in the lifeboats to be 5kg. (Typically, an immersion suit and lifejacket). Whilst this is the default assumption for PPE weight adopted by the UK HSE in 2008 in the 'Big Persons' Offshore Information Sheet, Installation Operators may be able to reduce this PPE allowance for their own installations, depending on the actual PPE they provide.

The design weights presented in Table 1.1 imply an increase in the reference value for lifeboats of between 10 kg and 14kg per passenger compared to 2008, confirming that many existing lifeboats installed on UK offshore platforms will require further derating as a result.

For existing installations where any POB reduction may create significant operational difficulties, it is recommended that Duty Holders also evaluate switching to an operating model where offshore personnel are actively allocated to lifeboats on the basis of their actual measured weight on arrival offshore. This change in lifeboat assignment strategy is not described in detail within this report but it could potentially maximise the installation POB above what can be achieved by recalculating design weights and continuing to randomly allocate personnel to their lifeboats.

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ABBREVIATIONS

CAA	Civil Aviation Authority
CPOGS	CityPort Oil & Gas Services
GRP	Glass Reinforced Plastic
HSE	UK Health & Safety Executive
IMO	International Maritime Organisation
LSA	Life Saving Appliances
MCA	Maritime and Coastguard Agency
MODU	Mobile Offshore Drilling Unit
NHS	UK National Health Service
OEUK	Offshore Energies UK
OIS	Offshore Information Sheet
PAX	Passengers
PFEER	Prevention of Fire and Explosion, and Emergency Response Regulations
POB	Personnel on Board
PPE	Personal Protective Equipment
SA	Statistical Allowance
SECEs	Safety and Environmentally Critical Elements
SOLAS	'Safety of Life at Sea' Convention - International Maritime Organisation
SWL	Safe Working Load
TEMPSC	Totally Enclosed Motor Propelled Survival Craft
UK	United Kingdom

1 INTRODUCTION

The weight and size of offshore energy workers in the UK sector is increasing. The increase in weight and size of personnel impacts on the design and operation of offshore equipment and systems. Key systems that can be affected include escape and evacuation systems, which are Safety and Environmentally Critical Elements (SECEs) and are installed on every UK offshore installation. It is an issue which creates hazards within the industry and it requires immediate attention by relevant stakeholders.

The issue of increasing weight and size of offshore personnel is already widely recognised within the UK offshore oil and gas industry. The Offshore Energies UK (OEUK) is the leading representative body for the UK offshore energy industry, with a not-for-profit membership organisation, and a history stretching back five decades. OEUK promotes open dialogue across all sectors of the offshore energy industry in relation to technical, fiscal, safety, environmental and training issues. OEUK engages both with its members, and also externally including governments, industry regulators and other stakeholders with respect to issues that affect its members, and drive improvement within the industry.

OEUK has already recognised the issue of increasing weight and size of offshore workers, and in December 2023 published a report on 'The identification of hazards related to the weight, size, and shape of offshore oil and gas workers in the UK' [01]. OEUK wished to identify and assess the potential hazards that might result from the increasing weight trend and then recommend suitable actions to be implemented by different stakeholders across the industry. The main focus of the December 2023 report was to report on a hazard identification exercise completed with members, industry experts and third party stakeholders in September 2023. The purpose of the hazard identification exercise was to identify suitable mitigating actions for the industry to address.

Within the December 2023 report, preliminary statistical analysis was presented relating to the mean weight of the offshore population in 2022. The report also included a recommendation for a new design review weight which could be used to measure and assess the suitability of existing lifesaving equipment for future operations. Unfortunately, the design review weight that was reported was not calculated in exactly the same way as previous design weight estimates published in 2008 by the UK Health and Safety Executive and was overly-conservative.

CityPort Oil and Gas Services (CPOGS) is an offshore technical safety consultancy which has previously studied and assessed trends in offshore weight for our clients in relation to their offshore operations. OEUK has requested CPOGS to complete further work on the statistical analysis of offshore weight to remove any uncertainty and provide further guidance to OEUK members regarding the correct statistical treatment of offshore weight data. OEUK has provided CPOGS with access to the original Vantage-POB 2022 source data to allow statistical studies to be completed.

CPOGS has been granted permission by several existing clients to report on previous statistical analyses, completed for them in relation to offshore population weight that are linked to their existing worldwide operations. This data is helpful in enabling CPOGS to define current and future trends in offshore weight data. The results of the statistical analysis are documented within this report.

1.1 Report Objectives and Scope of Work

The key objectives of this report are:

- To provide detailed statistical analysis of the weight of offshore personnel in 2022; and
- To provide a coherent methodology for OEUK members and other third-party stakeholders to determine safe and suitable design weight values for both new and existing lifesaving equipment.

The scope of work has included the following activities:

- Statistical reprocessing of the raw Vantage-POB weight data for the UK population of offshore workers in 2022, comprising some 38,900 records.
- Estimating meaningful statistical data in respect of the average weight and standard deviation of the weight distribution for the male, female and total population of offshore workers.
- Providing additional supporting statistical information from other relevant oil and gas industry sources regarding offshore weight trends.
- Presenting suitable methodologies to calculate the 95% confidence interval for the average weight of smaller sample populations of different size ‘N’ in relation to design weight limitations for lifeboats and liferafts.

The scope of work for this report specifically does not consider or address the following issues relating to the increasing size and weight of offshore personnel:

- Lifeboat design factors such as seatbelt load capacity to address heavier personnel.
- Trends in the size of the offshore workforce in respect of hip and shoulder width.
- Lifeboat seat design issues generally to address larger personnel.

The scope of work of this report in relation to offshore weight only applies directly to the UK offshore sector, but it is noted that data trends described within this report may also be applicable to other global operating locations. It is recommended that OEUK members give due consideration to all of their offshore operations worldwide when assessing risks associated with the increasing size and weight of offshore personnel.

1.2 Data Sources

This report could not have been compiled without the contribution of a number of other third parties. CPOGS would like to thank the following private companies for providing relevant weight data which is not currently available within the public domain:

- **Vantage-POB and LOGIC:** Vantage-POB is a shared industry system which is run on a not-for-profit basis on behalf of the offshore industry by LOGIC as the system custodian. Vantage-POB has provided OEUK and CPOGS with an anonymised dataset of recorded weights of UK offshore in 2022, which has been recorded for helicopter transit purposes.
- **Prosafe Offshore:** Prosafe Offshore is a leading mobile offshore accommodation provider which operates four flotels within their fleet that have accepted UK Safety Cases. Prosafe has been monitoring trends in the average weight of offshore personnel for the last five years and has granted CPOGS permission to provide summary data relating to past operations.
- **Floatel International:** Floatel International is also a leading mobile offshore accommodation provider, with four flotels within their fleet that have accepted UK Safety Cases. Floatel International also has two mobile accommodation units working in the UK sector in 2024. Floatel International has kindly given permission for CPOGS to share summary weight data relating to ongoing operations to support the general objectives of this report.

Within this report, CPOGS has also accessed publicly available National Health Service (NHS) England data relating to recent trends in size and weight of UK personnel [06]. This source dataset is effectively the parent population for the offshore workers although the UK population as a whole can be expected to vary considerably in terms of socio-economic influences and other diverse factors.

2 STATISTICAL ANALYSIS OF OFFSHORE WEIGHT DATA

Within this section of the report, detailed statistical analysis of the various data sources identified in Section 1.2 is provided. The statistical analysis of the Vantage-POB dataset has been completed by CPOGS consultants and independently reviewed by Chartered Statistician, Dr Marie Oldfield, to ensure that the calculated values of mean and standard deviation for the dataset are valid. Dr Oldfield is a member of the Royal Society of Statisticians and a key advisor to the UK Government on issues relating to statistics and their application.

2.1 Vantage-POB 2022 Weight Data

2.1.1 Dataset Overview

In the UK offshore oil and gas sector, working personnel are registered in the 'Vantage-POB' personnel tracking system operated by LOGIC on behalf of the offshore industry [02]. The Vantage-POB system ('Vantage') provides offshore workers with a unique identity number which is used to track important details relating to each individual. Information gathered includes offshore workers' survival training records, medical certificates and details of persons to contact in case of an emergency. When UK oil and gas workers travel offshore by helicopter, their actual weight is also recorded within the Vantage-POB database, which provides a very useful source of reference data for the purposes of this study.

In 2022, LOGIC, who are the custodians of the Vantage-POB system, were able to provide OEUK with an extract of anonymised population weight data from the Vantage-POB system and 38,933 individual data entries were provided in the original dataset. For each data point, a weight in kilograms and a shoulder measurement in centimetres is provided along with the sex of the individual.

The weight data provided has been recorded at the onshore heliports, and also by the helicopter administrators offshore who record the weight of personnel prior to helicopter transport back to the shore. Standard practice is to weigh offshore personnel in their normal clothing, including their shoes, but not including their transit suit or lifejacket. Both onshore and offshore, there are strict requirements for weighing scales to be regularly tested and calibrated. Therefore, all reported weights in the dataset are assumed to be clothed and accurate, with any obvious errors most likely associated with data entry processes.

In December 2022, OEUK released its latest 'Workforce Insight' report which detailed the organisation's most recent offshore oil and gas industry job data [03]. In that report, OEUK reported direct offshore jobs of approximately 30,300 personnel. Based on this information, it appears that the 2022 dataset obtained by OEUK is genuinely representative of the current offshore working population in the UK sector, given that the Vantage-POB dataset also includes onshore supporting personnel who are suitably trained to work offshore, but do so only infrequently.

The large size of the sample population is also beneficial as it reduces the statistical impact of inaccuracies in the recording of each individual weight measurement.

Of the 38,933 weight data entries, 1,379 are noted to be female and 37,554 are noted to be male. Therefore, the calculated percentage of females working offshore in the UK sector is approximately 3.5% of the overall population.

2.1.2 Data Analysis Methodology

For large populations such as offshore workers, the weight of personnel can be reasonably assumed to be normally distributed for engineering purposes. The Vantage-POB dataset contains more than 38,900 personnel and qualifies as a large population.

From the processed dataset, the population mean weight μ can be calculated directly using the following equations:

$$\mu = the\ mean = \frac{sum\ of\ all\ data\ points}{number\ of\ all\ data\ points} = \frac{\sum x}{N} \qquad (01)$$

The population standard deviation σ, is calculated as follows:

$$\sigma = standard\ deviation = \sqrt[2]{\frac{\sum(x-\mu)^2}{N}} \qquad (02)$$

Where:

μ = The population mean.

σ = The population standard deviation.

x = The values in the data distribution.

N = The total number of data points.

NB: The use of the term 'population' in the definition of the above variables is important to note. When studying the UK offshore workforce, the term 'population' refers to the whole group of offshore workers. Any smaller group of workers, such as the workforce on a single installation, or the passengers assigned to a lifeboat is described as a 'sample'.

The **Probability Density Function f(x)** for the normal distribution can then be defined in terms of the mean μ and standard deviation σ, and is as follows:

$$f(x) = \frac{1}{\sigma\sqrt[2]{2\pi}}.e^{\left[-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2\right]} \qquad \text{where } -\infty \leq x \leq \infty \qquad (03)$$

Similarly, the **Cumulative Density Function F(x)** for the normal distribution is as follows:

$$F(x) = \int_{-\infty}^{x} \frac{1}{\sigma\sqrt[2]{2\pi}}.e^{\left[-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2\right]} dx' \qquad (04)$$

When working with normal distributions, it is usual to make a change of variables to express the Cumulative Density Function in a standardised form. To this end, the standardised random variable u can be defined in terms of the population mean μ, the standard deviation σ and the true random variable x, as follows:

$$u \equiv \frac{(x-\mu)}{\sigma} \qquad (05)$$

The **Probability Density Function** can then be expressed in the standardised form:

$$f_u(u) = \frac{1}{\sqrt[2]{2\pi}} . e^{\left(-\frac{1}{2}u^2\right)} \qquad (06)$$

The form of the standardised Probability Density Function is shown in Figure 2.1 below.

The standardised **Cumulative Density Function** can then also be rewritten as:

$$F(x) = \varphi(u) = \varphi\left[\frac{(x-\mu}{\sigma}\right] \qquad (07)$$

The cumulative value of φ (also known as the 'Z factor') can be looked up in standard statistical reference tables for the Normal Distribution. The form of the standardised Cumulative Density Function for normal populations is shown in Figure 2.2 below.

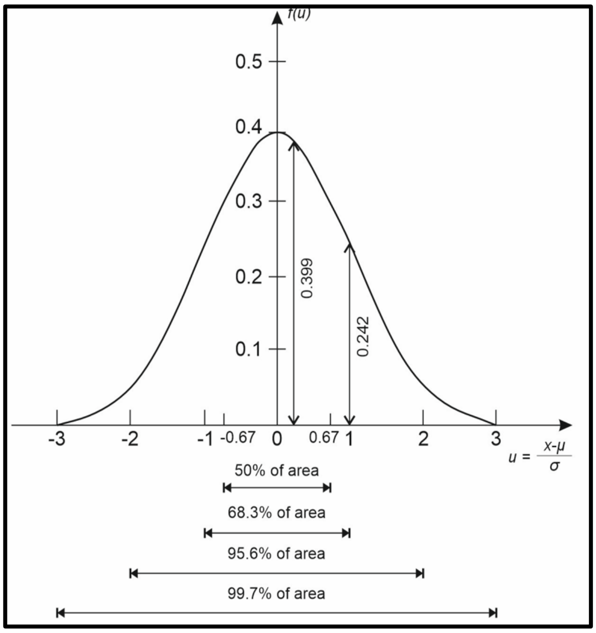

Figure 2.1 - Probability Density Function for a Standardised Normal Distribution.

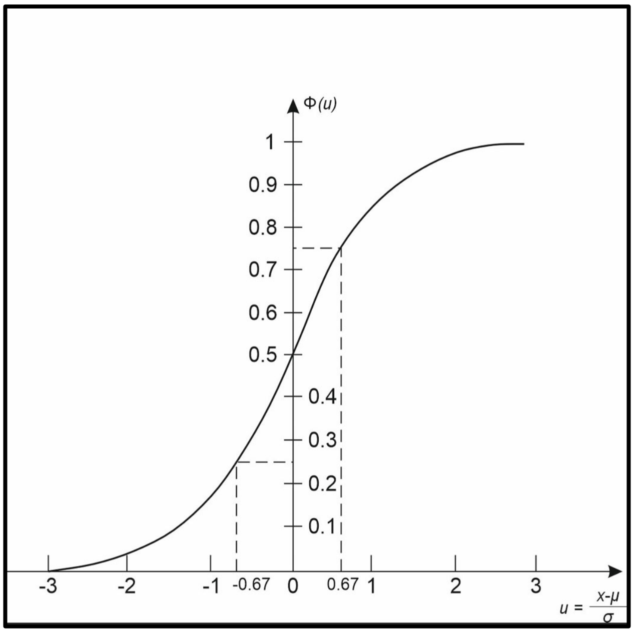

Figure 2.2 - Cumulative Distribution Function for a Standardised Normal Distribution.

2.1.3 Data Pre-Processing

Detailed analysis of the original Vantage-POB dataset indicates the presence of occasional errors in the data recording process. Errors in the recording of large datasets is not unusual when data is manually entered by personnel. However, before meaningful estimates could be made of the average weight and standard deviation of the offshore population, pre-processing of the raw data set was required to remove potential anomalies.

Within the raw Vantage-POB dataset, there were some blank data entries recorded with respect to weight, and also some data entries showing either zero or one kilogramme. In total, there were 183 entries in these categories, which is approximately 0.47% of the total dataset. All of these entries were removed from the raw dataset during pre-processing.

It has been assumed that the zero and one kilogramme data entries are likely to be related to data entry processes. It is logical to assume that data entry errors are independent of the actual recorded weight of the individual, in which case there is limited impact on the mean of the whole dataset by removing these entries from the record.

Also, within the raw dataset, there are four data points which were extremely low, indicating an individual weight of 10kg or less. These four data points were removed from the dataset as not being realistic of actual personnel weights. As there are only four points, the removal of these data entries does not have a significant input on the subsequent statistical analysis.

At the opposite end of the scale, there were four data entries for personnel with bodyweights in excess of 205kg in the raw dataset, of which three exceeded 220kg. It is possible that these could be genuine bodyweights of offshore personnel, but this seems unlikely given current ‘fitness for work’ medical requirements. It is also a possibility that these are weight entries that were recorded in pounds rather than kilos, but there is no means to test this hypothesis further. Ultimately, these four data points were removed from the final ‘cleaned’ dataset.

It was possible to test the sensitivity of the calculated weight and standard deviation of the whole offshore weight dataset to the exclusion/ inclusion of the datapoints mentioned above. This sensitivity work has been completed by CPOGS consultants, and the results indicate that the average weight of the population as a whole varies by approximately 10 grammes if the data entries above 205kg are included. Therefore, the inclusion of the data entries above 205kg is therefore not significant for engineering purposes.

As clear guidance is provided to offshore helicopter administrators on the processes and procedures for recording offshore passenger weight data, the impact of recoding anomalies is not estimated to be significant by CPOGS.

2.1.4 Data Processing Results

Following pre-processing of the Vantage-POB data, the mean and standard deviation of the dataset was calculated for the overall population of all workers (male and female combined), and the male and female populations in isolation, using equations (01) and (02) above. Table 2.1 below provides a summary of the results.

Table 2.1 - Mean and Standard Deviation of Offshore Personnel 2022 Vantage-POB Data.

2022 UK Offshore Workers - Category	Average Weight (Kg)	Standard Deviation (Kg)
Male Population of Offshore Workers	97.22	15.20
Female Population of Offshore Workers	78.48	15.28
Total Population of Offshore Workers	96.56	15.59

Sensitivity analyses were completed by CPOGS consultants for the above results by including and excluding the extra-small and extra-large values that had been removed during the data pre-processing stage. The results of the sensitivity analysis confirmed that removal did not have a material effect on the calculated averages in respect of defining design value for lifeboats.

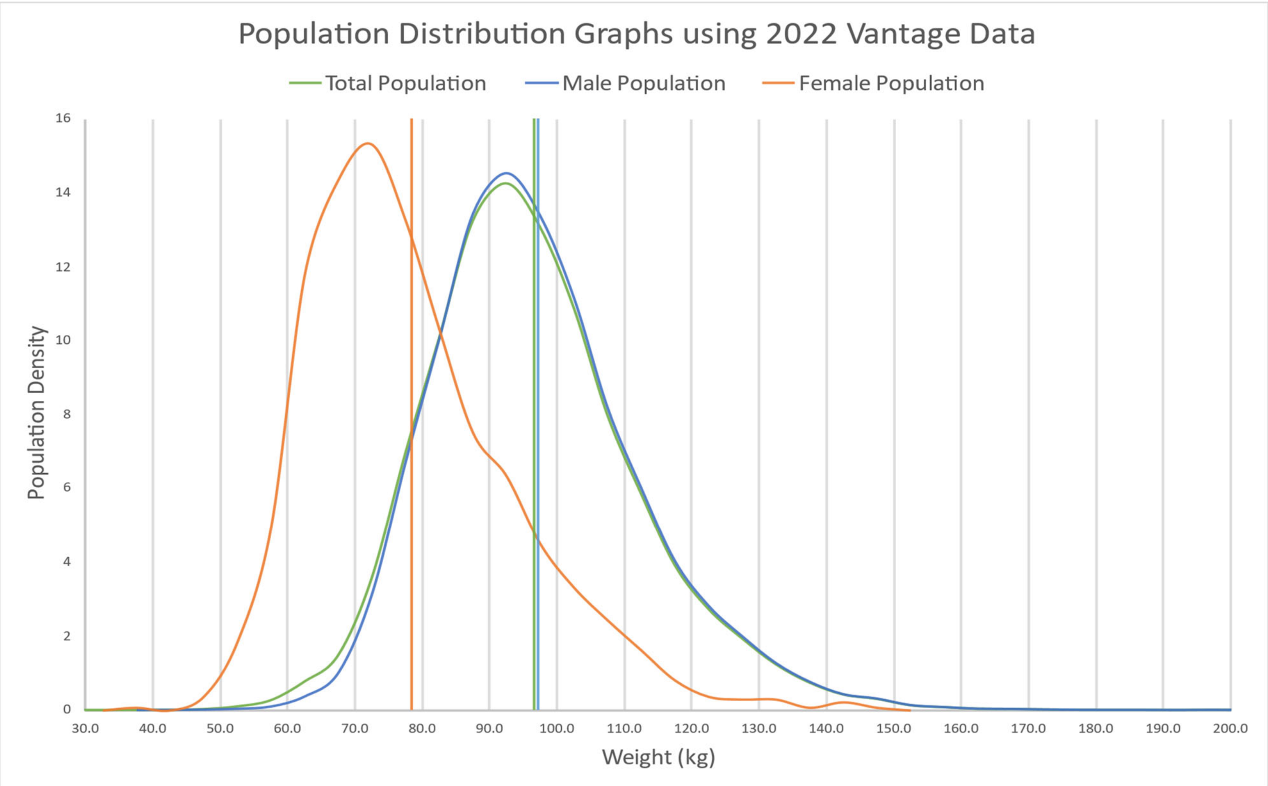

Figure 2.3 - Plot of the Vantage-POB 2022 Offshore Weight Data Smoothed Using a 5kg Data Bin.

Figure 2.3 shows the Vantage-POB offshore weight data plotted as a population density function. The distribution of the total population density function is shown in green, the male population in blue, and the female population in orange. The average weight of each population is shown as a dotted vertical line.

Closer inspection of the above graph shows that each of the populations analysed are skewed with respect to the classic normal distribution shape with the median value being lighter than the average weight.

Figure 2.3 also shows graphically how much the distribution of offshore weight is dominated by male data. This is to be expected given that males represent more than 96% of the offshore workforce.

Further work has been completed by CPOGS to test how accurately the offshore weight data models to the normal distribution. Figure 2.4 below presents a QQ plot which is a graphical illustration of the 'skewness' of a dataset. If all the data points in a dataset are perfectly normally distributed then the black line matches the blue reference line.

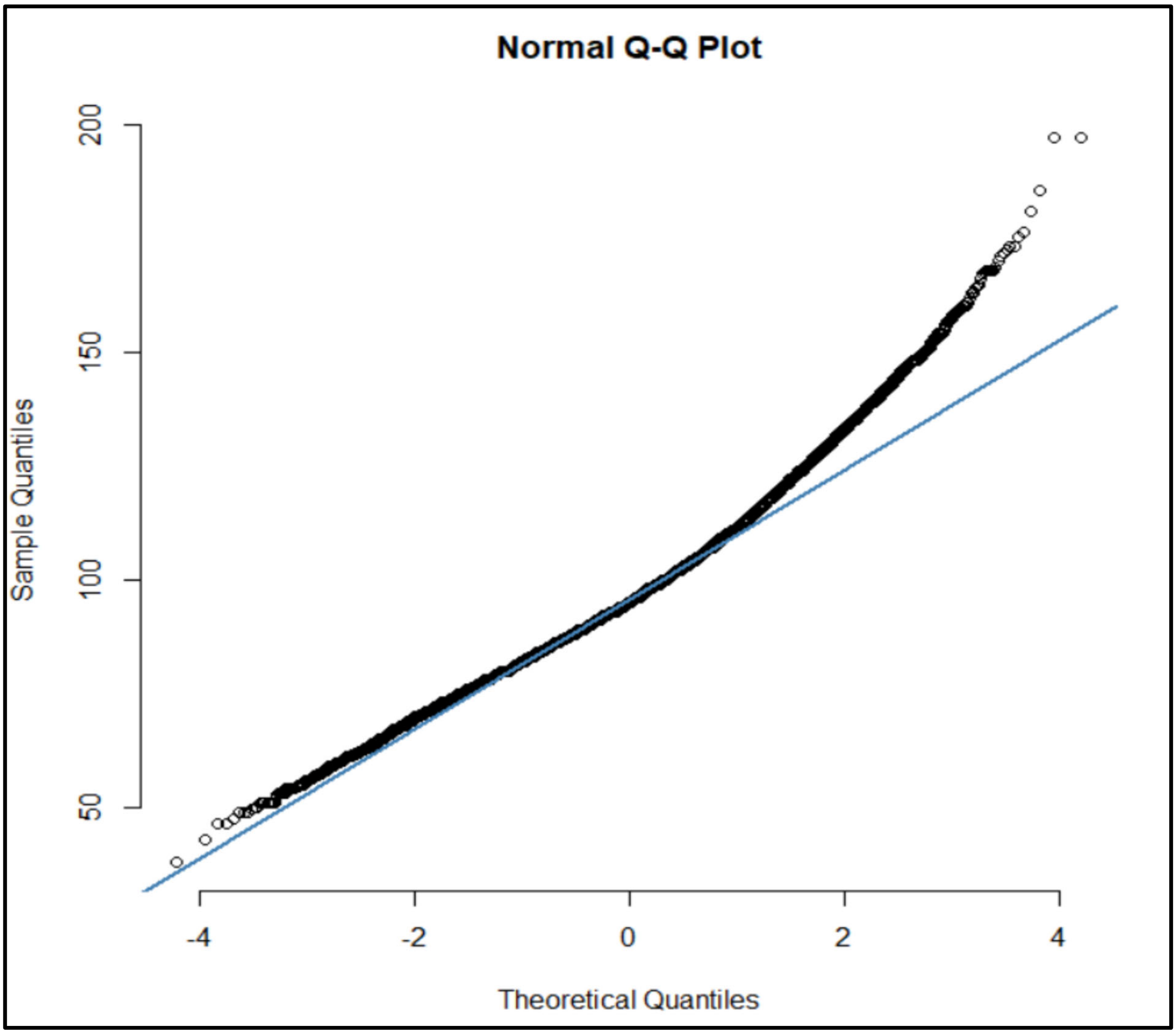

Figure 2.4 - QQ Plot Test for 'Skewness' of the Vantage-POB 2022 Weight Data.

The QQ plot indicates that the offshore data has a positive skew, in that the heavier weights are not perfectly normally distributed. However, the degree of skew is moderate and does not have a material effect on the engineering design value estimates constructed by CPOGS using the 2022 Vantage-POB dataset.

2.2 2008 Offshore Weight Data

In 2008, the average weight of oil and gas workers was calculated by the Civil Aviation Authority (CAA) and the UK Health and Safety Executive (HSE) using helicopter transit data. The mean weight was noted to be approximately 87kg. The results of the analysis were reported in the HSE Offshore Information Sheet OIS 12-2008 'Big Persons in Lifeboats' [04]. Although the exact methodology that was applied is not detailed, it is understood that the average weight was calculated from helicopter manifest data for offshore personnel.

OIS 12-2008 [04] does not state the average weight of the offshore population explicitly, but 87kg can be inferred from the design calculation for lifeboats that is reported.

The allowance for the statistical variation in the average weight of a sample population 'n' of 15 people is reported to be 'about 7kg', and 'around 4kg' for 50 people. From this data, it is possible to reverse calculate the standard deviation for offshore weight in 2008, which was in the range of 16.5kg to 17.2kg. This calculated value fits well with standard deviation estimates for other populations that have been reported by Marine and Coastguard Agency (MCA) Consultants, Burness Corlett, in 2006 [05].

2.3 Vessel Specific Transit Weight Data

Since 2018, CPOGS has completed various statistical analyses of the average weights of offshore personnel for different Duty Holders in response to various client issues. In each case, data has been extracted from offshore helicopter manifests and then been subjected to statistical analysis. The most recent datasets were collected in 2023 and 2024 from semi-submersibles, and these sets are considered the most relevant external dataset in respect of trend monitoring. Source data was provided by mobile offshore accommodation companies, Floatel International and Prosafe Offshore.

Installation A provided a weight dataset over a period of two months in December 2023 and January 2024 and a total number of 270 personnel transfers were studied during this period. The location of the installation was outside of the UK Sector, but with a very similar crew and guest profile to that expected for UK operations. For those particular operations, there were very few numbers of female personnel onboard and therefore only the statistics of the combined population are presented.

Table 2.2 - Mean and Standard Deviation of Offshore Personnel in 2023 and 2024 (Installation A).

Installation A 2023 to 2024	Outbound Weight (Kg)	Inbound Weight (Kg)
Mean Weight of Offshore Workers	96.30	93.76
Standard Deviation of Offshore Workers	19.30	19.36

It is interesting to note that the data analysis clearly indicated personnel are generally heavier on arrival onboard the installation ('outbound') compared to when they go home three or four weeks later ('inbound').

This pattern might reflect increased levels of exercise and a healthier lifestyle whilst personnel are offshore. A very similar trend in arrival and departure weights was observed by CPOGS when another statistical analysis was completed in 2018 for another accommodation unit operating in the UK sector at the time.

Overall, the data analysis for Installation A indicates a mean weight of 96.30kg, which is very similar to the predicted values calculated from the Vantage-POB 2022 data.

Installation B, operated by a different company, has also provided a weight dataset over a period of one month in January 2024. The transit weights of 609 personnel were recorded during this period. This installation was operating in the Gulf of Mexico, with a European crew and American oil workers as guests. For these particular operations, there were more female personnel onboard and therefore statistics are presented for male, female and the overall population.

Table 2.3 - Mean and Standard Deviation of Offshore Personnel in January 2024 (Installation B).

Installation B January 2024	Male Personnel (Kg)	Female Personnel (Kg)	Overall Population (Kg)
Mean Weight of Offshore Workers	94.38	88.20	94.17
Standard Deviation of Offshore Workers	19.34	18.73	19.32

In the Gulf of Mexico, personnel do not fly wearing helicopter 'transit suits' and therefore, there is less opportunity for offshore weight data to include additional items. Also, personnel in transit in the Gulf of Mexico do not tend to wear as many layers of clothing. This may be why the average weight is approximately 2kg lighter than the 2022 Vantage-POB reference data. However, natural variation in the average weight is to be expected for the size of the above population and this factor alone would be sufficient to explain the difference from UK reference weights for this sample population size.

Due to the smaller sample population sizes of the installation specific data, the overall results have wider confidence limits, but both sets of results provide confirmation of the general trend in the increasing weight of offshore workers.

2.4 NHS Data

An interesting source of UK weight data is available from the UK National Health Service (NHS Digital) via the Annual Health Survey for England in 2021 [06]. The Survey for 2021 reports data trends from 1993 through to 2021 and reports data separately for men and women.

The weight data is broken down by age with categories of 16-24 years, 25-34 years, 35-44 years,45-54 years, 55-64 years, 65-74 years and 75+ years. The heaviest weight category is for the 45-54 age group, which in 2021 recorded 89.2kg as the average weight.

It is understood that the NHS weight data for UK adults is recorded with the adult wearing light clothing and without shoes on, but detailed guidance on data collection is not provided or publicly available. However, minimal clothing may account for part of the variation that is observed. Figure 2.5 below confirms the steady increase in the average weight of males within the UK population as a whole over the last 35 years.

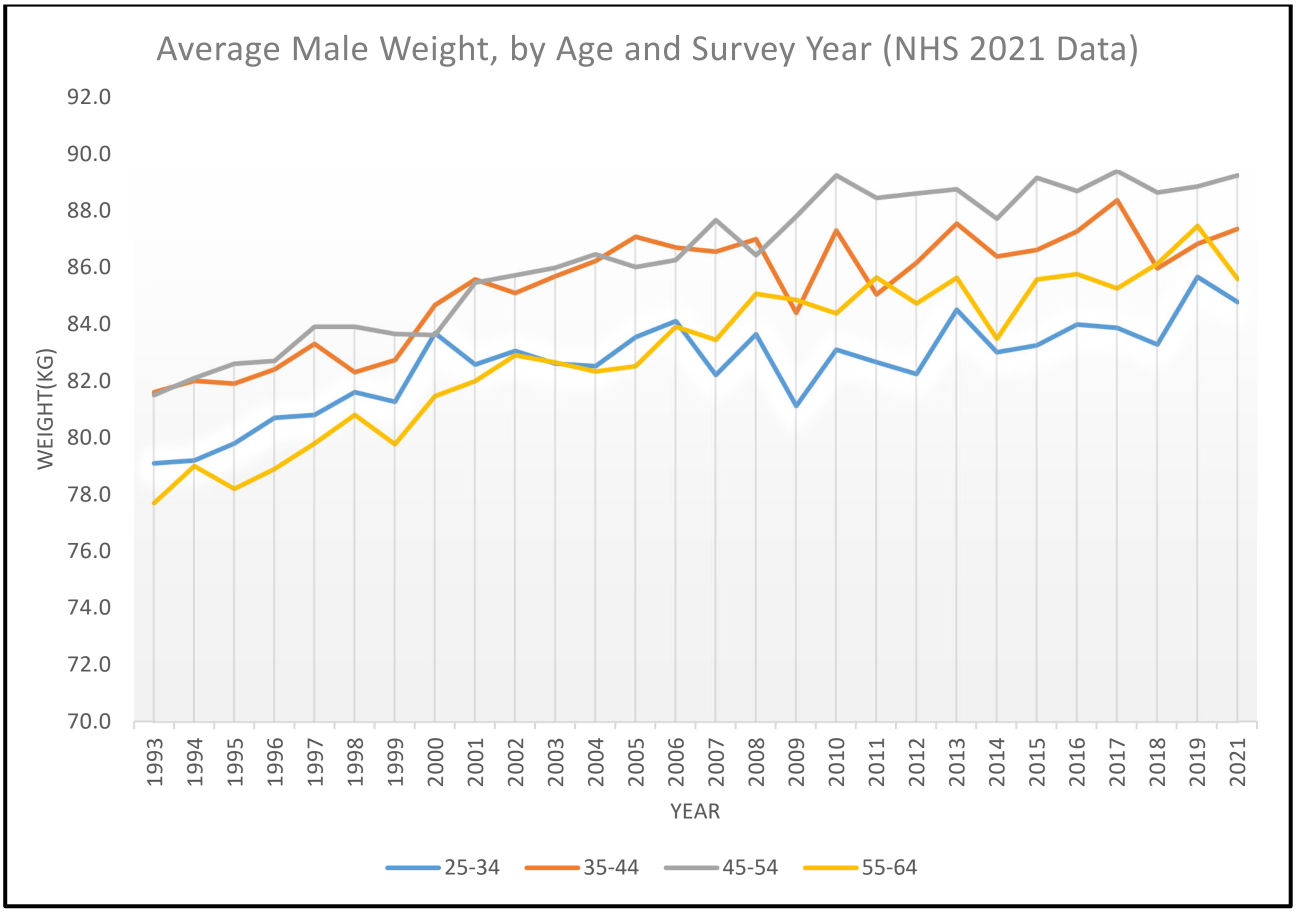

Figure 2.5 - NHS 2021 Annual Survey Weight Data for UK Males by Age Group.

It should also be recognised that the UK NHS data provides weight data for UK adults from a wide range of socio-economic and ethnic groups, which may lead to noticeable differences when compared to offshore workers. The offshore worker population generally enjoy a good standard of living and may include a significant north-west European ethnic background in the worker composition. Offshore workers tend to be based in traditional oil and gas recruitment areas within heavy industries in the north-east of Scotland, England and also in Norway, Denmark and the Netherlands.

Whilst acknowledging that the NHS data may not be fully representative of offshore UK oil and gas workers, the UK-wide weight data does indicate a steady increase in weight of approximately 0.275kg per year as a trend over time.

2.5 Discernible Trends in Offshore Weight Data

The average weight of offshore workers was calculated for from the 2022 Vantage-POB dataset and plotted alongside other historical data references, as shown in Figure 2.6 below.

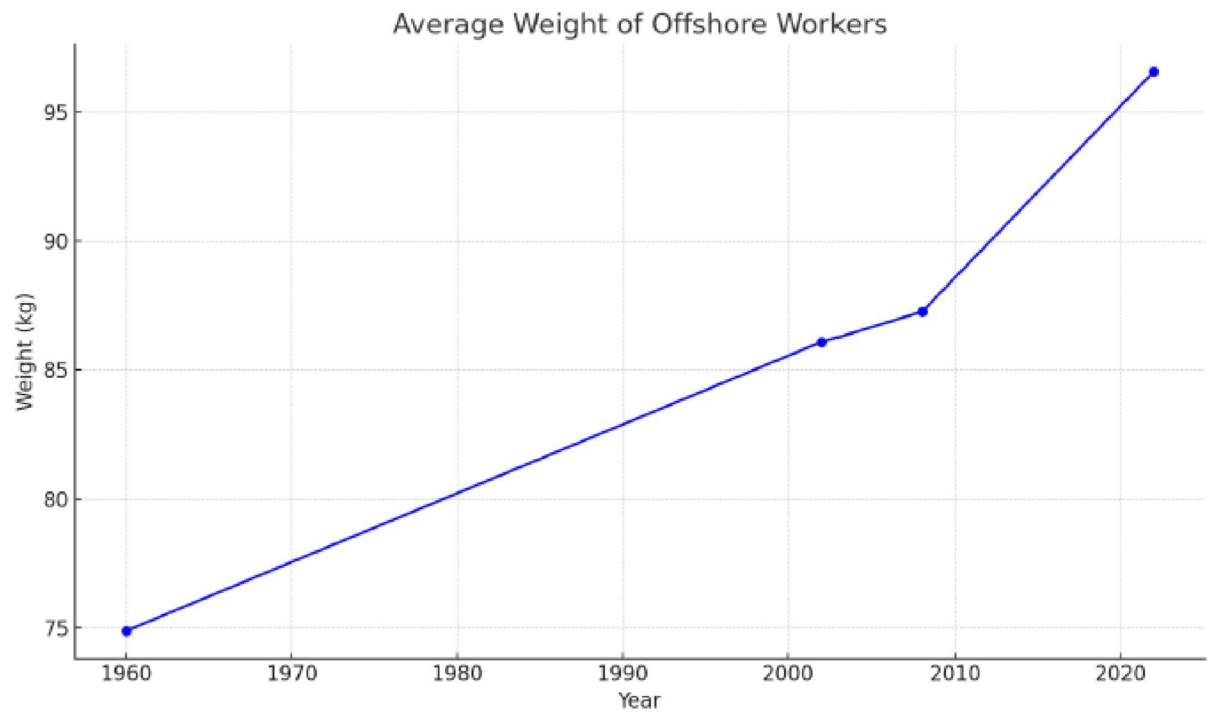

Chart 1: Average weights for offshore populations 1960 – 2022

Figure 2.6 – Graph Showing the Average Weight of Offshore Personnel Plotted Against Time over the Period 1960 to 2022.

In 2008, the equivalent average weight of oil and gas workers had been calculated in a similar fashion by the Civil Aviation Authority (CAA) and the UK HSE. The mean was noted to be approximately 87kg (See Section 2.2 above). Applying a simple linear relationship implies that offshore personnel have been increasing in weight by about 0.68kg a year.

If this relationship is extrapolated on a linear basis, then the predicted average weights of offshore personnel will be as shown in Table 2.4 below in any particular year.

In 2025, the average weight of offshore workers is expected to be 98.60kg and in 2030, six years from now, it is predicted to be 102.02kg if the linear trend continues.

When predicting trends in future weight data, it is important to be cautious as existing trends may change due to different external factors, including increases in the size of the workforce (which may introduce younger, fitter personnel to the industry), and also measures introduced by the Energy Industry to ensure offshore personnel are fitter and healthier.

Whist the weight of offshore personnel has clearly increased since 2008, there is no clear indication that the weight increase is also linear over that period due to the absence of data points in earlier years.

Table 2.4 - Predicted Body Weight of Personnel Assuming Weight Increases Linearly with Time.

YEAR	AVE WEIGHT (KG)	YEAR	AVE WEIGHT (KG)
2022	**96.56**	2028	100.66
2023	97.24	2029	101.34
2024	97.93	**2030**	**102.02**
2025	98.61	2031	102.71
2026	99.29	2032	103.39
2027	**99.97**	2033	104.07

One of the background engineering criticisms of the design weight of 98kg which was introduced for lifeboats in 2008 was the fact that it did not account for the increasing trend in offshore weight. This concern is valid but can be addressed. When setting new guidance values for lifeboat loading weights, it is recommended that weight projects are projected forward but by no more than 5 years from the most recent dataset. In addition, trends in offshore weight need to be monitored periodically by repeating the Vantage-POB data analysis.

As reported in Section 2.4 of this report, the weight trend reported by NHS England for adult males is less than half of the observed trend in the weight of offshore workers (see Section 2.5). This fact also points to caution when determining new design weight reference points for lifeboats.

In 2022, the analysis of the raw data indicates that the standard deviation of the offshore population was 15.6 kg which is about 8% less than 2008. The small negative change in the population standard deviation is important as it suggests that the shape of the weight distribution has not increased positively in 14 years.

Whilst it is true that offshore personnel are getting heavier, it is also to be expected that all offshore personnel are getting heavier at the same time. If this is the case, then the shape of the normal distribution is unlikely to change significantly, even though the average weight is increasing. If the shape of the weight distribution is not changing, then the standard deviation will not change significantly either.

The expected general movement of the weight distribution over time can be seen in Figure 2.7 below which references the 2008 data, the 2022 Vantage-POB data, and data predictions for 2030 based on linear extrapolation.

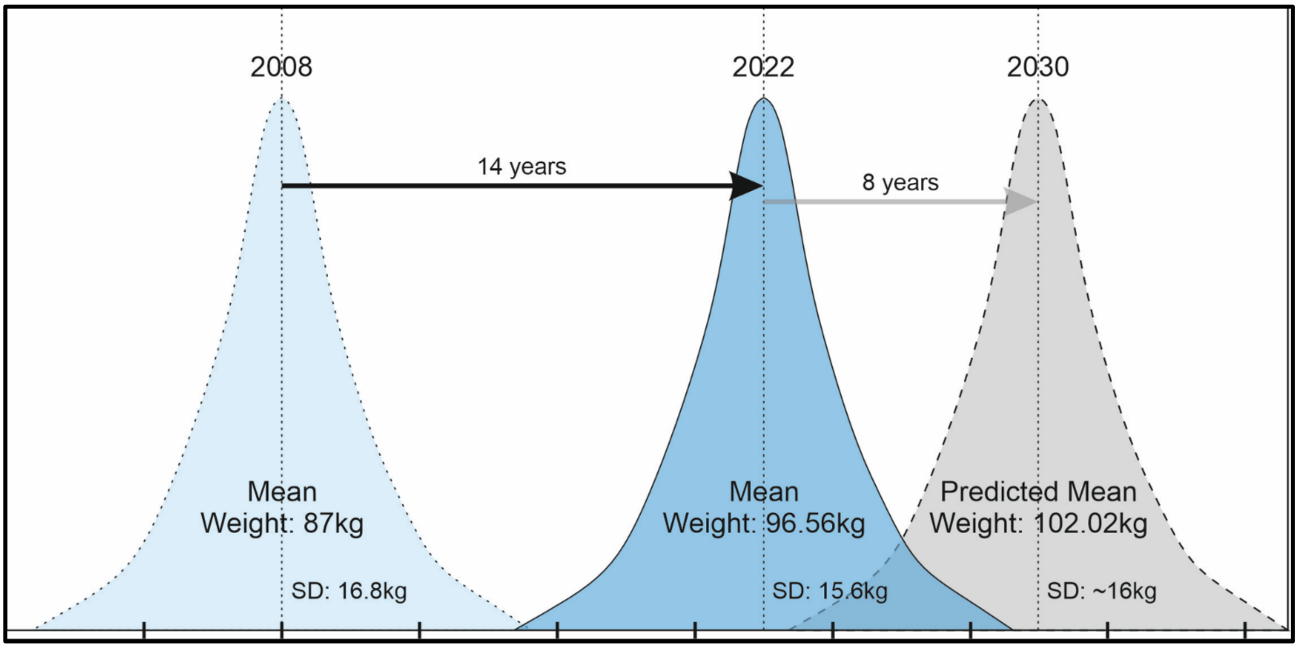

Figure 2.7 – Predicted Migration of the UK Offshore Worker Weight Distribution with Time.

3 DESIGN WEIGHT CALCULATIONS FOR EVACUATION SYSTEMS

3.1 Lifeboat Passenger Allocation

Lifeboats are provided onboard ships and other marine structures (such as energy installations) to provide a reliable means of evacuation for personnel onboard in the event of a major emergency that threatens the integrity of the host structure. The passengers within the lifeboat are transported to a place of safety remote from the original hazard.

There are two alternative approaches to allocating passengers to individual lifeboats which can be summarised as follows:

- Active passenger allocation.
- Random passenger allocation.

When Duty Holders are following the active passenger allocation approach, offshore personnel are actively assigned to a particular lifeboat by the Offshore Management team. The current weight of each lifeboat passenger is measured and recorded, and the total weight of all assigned passengers is calculated and compared to the available payload of the lifeboat on a real-time basis. This active approach ensures that the lifeboat is not overloaded beyond its safe working load (SWL) in the event that a launch is necessary but places an ongoing administrative burden on the Management Team.

The more common approach is random allocation of passengers to lifeboats. In this particular situation, offshore personnel are randomly assigned to an offshore lifeboat on arrival offshore. To ensure that the lifeboats are not overloaded beyond the SWL in the event of an evacuation, a 'design weight' is chosen that is significantly higher than the average weight of the offshore population as whole. The design weight is specifically chosen so that in 95% of the situations when the lifeboat is fully loaded and ready to evacuate, the payload will not exceed the SWL.

The random passenger allocation model is the existing approach observed by maritime vessels and by marine regulatory organisations such as the International Maritime Organisation (IMO).

It should also be noted that the energy industry is continually designing and building new installations for offshore service. Examples of new builds include Mobile Offshore Drilling Units (MODUs) and accommodation platforms. The design and engineering teams for these new offshore installations require an understanding of appropriate design weights to use for lifeboats for mobile installations intended for UK operations.

The standard methodology for calculating the design weight for a lifeboat is described within this sub-section.

3.2 General Design Requirements for Lifeboats and Liferafts

Marine evacuation systems such as lifeboats and liferafts are designed, supplied and operated according to international codes and standards to ensure that the craft are fit for purpose and will be available when required. The primary global references for the evacuation systems fitted on ships and other marine vessels are provided by IMO. Two of the key references are:

- The International Convention for the Safety of Life at Sea (SOLAS) [07]; and
- The International Life-Saving Appliance code [08].

The above conventions and codes are then updated periodically with amendments and are also supported with Marine Circulars and Guidance Notes issued by the IMO Maritime Safety Committee.

Within the IMO documentation, the design reference weight for passengers in lifeboats was initially defined at 75kg per person. However, this value has been increased to 82.5kg per person in 2010 for new vessels in recognition of increasing body weight of sailors and passengers.

Within the oil and gas industry, it has long been recognised that the IMO design requirements for lifeboats and liferafts were not suitable for offshore oil and gas workers. In 2005, OEUK, leading industry stakeholders, and the UK Health and Safety Executive (HSE) reviewed relevant information on the weight and size of the offshore population of oil and gas workers. The work completed at that time studied many different reference sources including weight studies prepared by the Civil Aviation Authority (CAA) and the MCA.

The 2005 review resulted in formal recognition that the weight of offshore personnel in the UK sector exceeded SOLAS requirements for the weight of passengers in marine evacuation systems, and changes were necessary. In 2008, the UK HSE issued Offshore Information Sheet No. 12/2008 ‘Big Persons in Lifeboats’ [04] that resulted in the de-rating of some lifeboats, and the replacement of some other boats and davits to ensure that the offshore population could be safely evacuated, if required.

Within OIS 12/2008, a new design weight was established for lifeboats and evacuation systems used in the UK sector of 98kg. The design weight was selected based on the engineering design premise that the ‘average sample body weight’ of the full complement of passengers onboard the lifeboat should not exceed the design reference weight, 95% of the time. The average weight of the offshore population at that time was calculated in 2008 to be 87kg, so the design weight was 11kg higher.

This engineering approach is generally robust for safety systems where large safety factors of two or more are also applied to the design/ engineering process, as is the case with lifeboats. The CAA use the same approach for calculating reference pay loads for helicopters. A detailed description of this design approach being applied to lifeboats is provided in the MCA Research Project 555 Report from 2006, entitled ‘Development of Lifeboat Design’ [05].

This design approach is relevant whenever personnel are randomly assigned to a lifeboat. For example, where lifeboats are linked to the cabin to which personnel are assigned to on arrival on an installation. This process is known as ‘random passenger allocation’ as described above.

The rationale and methodology for the calculation of the lifeboat design weight is important to understand, as the maximum loading capacity of the lifeboat affects the calculation of the correct design weight. This issue is not unique to the Maritime industry. In the Aircraft industry, the issue is known as the 'small aeroplane problem', whereby the number of persons the aircraft is intended to carry influences the design weight calculation.

3.3 Design Weight Rationale and Calculation Method

If the design population of interest in respect of lifeboat or liferaft design consists of a single defined group such as UK offshore workers, then the calculation of a confidence interval for the 'mean sample body weight', W_{SM}, is relatively straightforward, once the population statistics are known.

This calculation methodology assumes that the weight of the parent population is normally distributed. This approach is a robust assumption for engineering design purposes when considering the North Sea offshore worker population as a whole.

For any reference population, any one individual selected at random from the whole population can be of any weight. Based on probability, there is a 95% chance that their weight will be less than the 95% confidence interval value for the population as a whole. When only one person is selected, the 95% confidence interval is large.

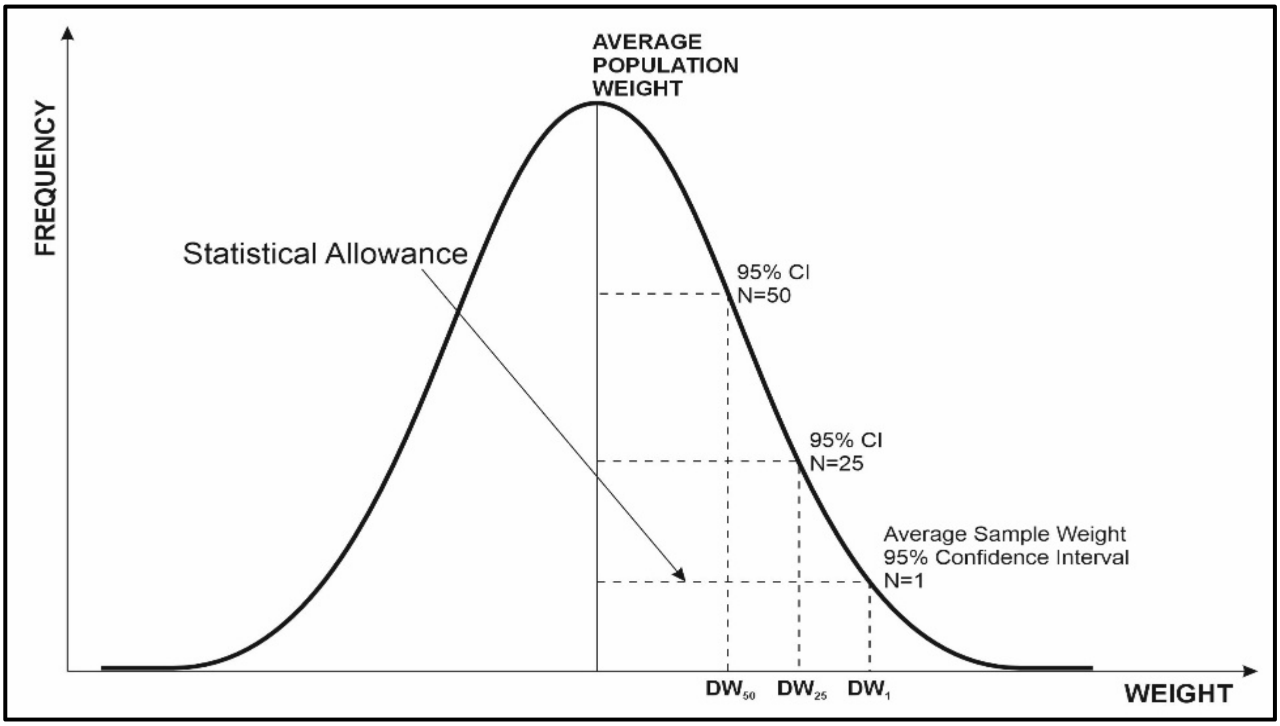

Figure 3.1 – Example Confidence Intervals for Sample Populations as the Sample Size 'N' Increases.

If a random sample group of 'N' personnel from the whole population is selected, then the 95% confidence interval for the average weight of the sample group (W_{SM-95}) will be smaller than for the individual described above, as the sample will include both large and small personnel and their weights cancel out. As the size 'N' of the sample group increases, the 95% confidence interval for the average weight of the small sample group will tend to converge towards the average weight of the whole population.

For lifeboat design, 'N' is analogous to the nominal POB capacity of the lifeboat or liferaft and the 95% confidence interval for the average weight of the sample group (W_{SM-95}) is equivalent to the design weight.

This principle is shown graphically in Figure 3.1 above. It can be seen that the design confidence interval for the average weight of the sample group decreases as the size 'N' of the sample group increases. The difference between the average weight of the parent population and the confidence interval value is referred to in this report as the 'statistical allowance' (SA). The statistical allowance becomes smaller as the sample size 'N' increases.

Mathematically, the above design values can be calculated as follows:

W_{SM-95} = the statistical allowance (SA) + the population average weight (μ) (08)

The statistical allowance, for the average weight W_{SM} of a smaller sample population, with confidence interval (CI) can be expressed as follows:

$$SA_{CI} = \frac{z.\sigma}{\sqrt{N}} \qquad (09)$$

Where:

SA_{CI} = The statistical allowance for a confidence interval CI.

z = 1.645 for a 95% confidence interval (one tail only of the normal distribution).

σ = The standard deviation of the whole parent population.

N = The size of the smaller sample population.

The population average weight (μ) can be calculated directly from the population data provided, such as the Vantage-POB 2022 dataset, using normal statistical methods.

The above calculation methodology is best explained by means of a simple example, which follows the methodology described in the MCA 2006 Report by Burness Corlett [05].

3.3.1 Design Weight – A Simple Example

A manufacturer is designing a new lifeboat in 2024 with a nominal capacity of 50 personnel. The designer wants to ensure that the probability of the fully loaded weight of the lifeboat being less than the safe working load (SWL) of the lifeboat and davits is 95%.

The average weight of the whole population is calculated to be 98kg and the standard deviation of the whole population is 17kg.

W_{SM-95} = the population average weight (μ) + the statistical allowance (SA)

$W_{SM-95} = 98 + (1.645 \times 17) / \sqrt{50}$

$W_{SM-95} = 98 + 27.965 / 7.07 = 87 + 3.95 = 101.95$kg

The above example ignores additional weights such as personal protective equipment (PPE), which can also be included in the calculation, depending on what the passengers are required to wear in accordance with emergency procedures.

If an allowance of 5kg per person is included in the calculation for mandatory PPE use, then the design weight for the 50 man new lifeboat in 2024 is 106.96kg.

3.4 Design Weight Calculations – The 2022 Vantage-POB Data

The same calculations can be completed using the 2022 Vantage-POB data. From Section 2.1.4 of this report, it has been shown that the average weight of the UK offshore population in 2022 was 96.56kg and the standard deviation was 15.59kg.

In 2008, the CAA approach to calculating a design weight assumed a reference passenger capacity (PAX) of 15 and a 3kg allowance for the transit suit and lifejacket. Also in 2008, the UK HSE/ MCA assumed a reference PAX of 50 and a 5kg allowance for the offshore life jacket and immersion suit. Repeating the CAA and HSE/ MCA calculations in 2022 using the above reference values for PAX and PPE, we were able to derive the following results for comparison purposes:

<u>CAA Design Value Parameters</u>

W_{SM-95} = the population average weight (μ) + the statistical allowance (SA) + PPE

$W_{SM-95} = 96.56\text{kg} + (1.645 \times 15.59 / \sqrt{15}) + 3.0\text{kg}$

$W_{SM-95} = 96.56 + (25.646 / 3.87) + 3.0 = 96.56 + 6.62 + 3.0 =$ **106.18**kg

<u>HSE/ MCA Design Value Parameters</u>

W_{SM-95} = the population average weight (μ) + the statistical allowance (SA) + PPE

$W_{SM-95} = 96.56 + (1.645 \times 15.59 / \sqrt{50}) + 5.0\text{kg}$

$W_{SM-95} = 96.56 + 25.646 / 7.07 = 96.56 + 3.63 + 5.0 =$ **105.19**kg

The above values indicate that the reference design weight for lifeboats in 2022 needs to increase from 98kg to approximately 106kg per person. This implies that if Duty Holders wish to continue to randomly allocate personnel to lifeboats, then the lifeboat POB will need to be derated.

3.5 Design Weight Considerations

One of the OEUK recommendations for Duty Holders arising from the increase in offshore weight is to complete a PFEER Regulation 5 Risk Assessment (Prevention of Fire and Explosion, and Emergency Response Regulations) to assess the suitability of their existing and future lifeboat provisions.

To complete this scope of work, it is necessary for Duty Holders to define an appropriate design value to use. This report suggests a suitable methodology for OEUK members and other third party stakeholders, including the UK HSE and OEUK members, on how to approach this process.

The design weights for the assessment of the suitability of lifeboats will vary depending on whether the Duty Holder is assessing the suitability of existing lifeboat provisions or considering installing new lifeboats.

3.5.1 Design Weight Values for New Lifeboat Provisions

A key question for stakeholders to consider is what should be a suitable design weight reference value for lifeboat provisions for the offshore energy industry to work to in 2024? This issue is particularly relevant when Duty Holders are commissioning and building new installations such as mobile offshore drilling units (MODUs).

Given that there is reasonable probability that the average weight of offshore personnel will continue to increase, (at least in the short term) then using the Vantage-POB 2022 data without suitable adjustment could lead to a design weight for new lifeboats that is insufficient at the time it will be implemented.

Equally, it is not appropriate to assume that offshore weight will continue to increase in a linear fashion year on year. There is uncertainty that the current offshore weight trend will continue and therefore, it is considered prudent not to project forward weight estimates by more than five years from the date of the last reference offshore weight dataset in 2022. Based on Table 2.4 in Section 2.5 of this report, the predicted average weight of the offshore population in 2027 will be 99.97kg.

Another factor that could change in the current five-year period is the standard deviation of the whole reference population. Comparison of the 2008 weight data with the 2022 weight data indicates that the population standard deviation has not changed significantly, but this is still an important variable that could increase in the future and so must be considered.

The standard deviation (SD) value for 2008 described in this report is an estimate that was back-calculated by CPOGS. It is a coarse estimate as it was not derived directly from the original source data. However, it appears that the standard deviation had stayed constant or even decreased slightly since 2008. In order to be conservative, it is recommended that a standard deviation of approximately 17.5kg is used, which is approximately 10% higher than the Vantage-POB standard deviation figure calculated from the 2022 dataset.

As noted in the preceding sections, the nominal capacity of the lifeboat affects the calculation of the 95% confidence interval design weight value. For many offshore installations, the lifeboats are relatively small - often with a maximum capacity of between 25 to 35 men. As installation POB increases, so generally does the size of the lifeboats, and lifeboats with 125 man capacity are sometimes installed on the largest offshore accommodation units. Therefore, it is appropriate to use representative capacities to derive new design values. CPOGS recommends 'N' values of 15, 25, 50, 75 and 100 to be used for any lifeboat with a nominal POB in excess of this value and lower than the next upper 'N' value.

With respect to PPE, it is considered prudent for the industry to maintain the current allowance of 5kg for the weight of mandatory PPE for the time being as a suitable reference value. It should be noted that the use of immersion suits in totally enclosed lifeboats is open to challenge by UK Duty Holders as both IMO and HSE recognise that the use of immersion suits inside totally enclosed motor-propelled survival craft (TEMPSC) leads to heat exhaustion [09]. However, until changes are agreed, it is conservative to maintain current practices.

Using the above data values, the proposed design values calculated by CPOGS for new lifeboats from 2024 onwards, using 2027 weight projections based on 2022 weight data and trends, are presented in Table 3.1 below.

Table 3.1 - Recommended Design Values for New Lifeboats of Different Sizes Using Vantage-POB 2022 Data and a Five Year Forward Linear Weight Extrapolation to 2027.

Lifeboat Size (Nominal POB)	Reference 'N' Value	Assumed Population		PPE Allowance	Recommended Design Weight (kG)
		Average weight	Standard Deviation		
15 to 24	15	99.97	17.5	5.0	112.40
25 to 49	25	99.97	17.5	5.0	110.73
50 to 74	50	99.97	17.5	5.0	109.04
75 to 100	75	99.97	17.5	5.0	108.29
100+	100	99.97	17.5	5.0	107.85

Duty Holders purchasing bespoke lifeboats to order may wish to conduct detailed calculations of the absolute design value themselves, taking into account their own requirements for POB capacities.

Of course, it should be remembered that the UK HSE may choose to recommend default minimum design values of their own for lifeboats in a future update of OIS12/2008. However, it is also probable that the UK HSE could allow Duty Holders to determine their own design values in parallel for their own installations, following the general UK goal setting regulatory philosophy. Any design value determined by the Duty Holders should be fully described and justified in the individual Installation Safety Case.

3.5.2 Assessing Design Values for Existing Lifeboat Provisions

A current industry recommendation for Duty Holders of UK Offshore Installations is to complete a PFEER 5 Risk Assessment in respect of bigger personnel offshore. This assessment is necessary to assess the suitability of their existing lifeboat provisions in respect of increasing body weights of offshore personnel.

In order to assess the degree of risk as accurately as possible, it is recommended that all Duty Holders gather key data before calculating their own level of residual risk exposure and new design reference weights for their own installations. This information includes the following:

- The measured weight of each lifeboat.
- The offshore weight data for their own installation population.
- The weights of mandatory PPE required during evacuation.
- The remaining lifetime of the installation.

The first recommendation to Duty Holders is to obtain an accurate weight of their twin fall SOLAS designed lifeboats using weight cells. This scope of work can be completed offshore without it being necessary to remove the lifeboats from their davits. Lifeboat manufacturers and servicing agents are able to assist with this scope of work which does not take long to complete, based on engineering feedback from past operations.

Weighing the lifeboats is essential and necessary as older lifeboats are prone to weight gain due to material deterioration. It is known that fibreglass lifeboats can have issues with delamination of the glass reinforced plastic (GRP) construction and/ or deterioration of internal buoyancy foam which can then retain water, reducing the available payload for passengers. Any loss of payload affects the subsequent design value calculation.

The second recommendation is that Duty Holders collect and study their own offshore weight data where it is meaningful to do so before completing design value calculations. For some types of installations, there may well be crews working offshore with limited personnel turnover, and average weights may vary significantly from the parent population. Anonymised weight data can be collected from the helicopter flight manifests and completion of basis statistical analysis will help define the extent of the problem for each offshore installation.

Finally, it is recommended that each operator weighs the PPE that personnel are required to wear in the lifeboats in order to have accurate information regarding all numerical values relevant to the design value calculation.

It may also be necessary to add an allowance for any modifications that may be necessary to the lifeboats in order to increase the load capacity of lifebelts above the present 100kg limit required by SOLAS and the life-saving appliances (LSA) for IMO approved lifeboats. The lifeboat manufacturers should be able to advise further in this respect.

Each Operator or Duty Holder can then calculate relevant design values for their own installation using the same process as described in Section 3.5.1 above. However, the Duty Holder may wish to vary the projection of the future reference weight to ensure that there are unlikely to be any further requirements to modify the lifeboats again in future. As an example, if a production installation is due to be decommissioned in 2030, the operator may choose to adjust the assumed population weight by a small margin to match with operating intentions.

It is important to note that the results of the design value calculation for the lifeboats on each UK installation are likely to be different, based on the variation in the platform specific parameters. Duty Holders should complete their own assessments.

Existing Installation Example

The Duty Holder of 'Production Installation A' needs to assess the suitability of their existing lifeboats. The platform has a maximum POB of 100 personnel noted within the accepted UK Safety Case and is equipped with three 50-man lifeboats, each with an existing design value of 98kg in accordance with OIS 12/2008 and PFEER requirements [10] for 150% lifeboat capacity.

Review of the platform population weight data completed as part of the PFEER Regulation 5 Risk Assessment indicates that the average weight of the installation crew is similar to the predicted values for the UK offshore workforce as a whole at approximately 96kg.

The operator has weighed each of the lifeboats, fully equipped and ready for operation but without passengers onboard, using a load cell arrangement. The load cell measurement indicates that the actual weight of the fully equipped lifeboat without any passengers onboard is 5,380kg.

The lifeboat Original Equipment Manufacturer (OEM) has confirmed that the design safe working load (SWL) of the lifeboat is 10,260kg and this matches the SWL stated on the lifeboat certification plate offshore. Subtracting the actual load cell weight of the empty lifeboat from the SWL for the original lifeboat design indicates that the lifeboat today has an available payload capacity of 4,880kg.

The Duty Holder intends to operate Production Installation A until 2028 and, based on current trends, an average weight for the offshore population of 100.66kg is therefore assumed with a standard deviation of 17kg. The weight of the actual PPE used onboard the installation has been accurately measured by the Duty Holder and is noted as 3.83kg per person.

W_{SM-95} = the population average weight (μ) + the statistical allowance (SA) + PPE

$$W_{SM-95} = 100.66\text{kg} + (1.645 \times 17 / \sqrt{50}) + 3.83\text{kg}$$

$$W_{SM-95} = 100.66 + 27.965 / 7.07 = 100.66 + 3.95 + 3.83 = \mathbf{108.44}\text{kg}$$

Therefore, the new design weight value selected to ensure the lifeboats are fit for purpose until end of field life in 2028 is 108.44kg. This calculated design value implies the new maximum acceptable POB of each lifeboat is reduced to 45 personnel (4,880kg / 108.44kg = 45 Personnel).

4 DISCUSSION AND CONCLUSIONS

The key objectives of this report are to provide more detailed statistical analysis of the weight and size of offshore personnel in 2022, and to provide a coherent methodology for OEUK members and other third party stakeholders to determine safe and suitable design weight values for new and existing lifesaving equipment, based on current offshore weight trends in the UK sector.

Statistical reprocessing of the raw Vantage-POB weight data for the 2022 UK population of offshore workers has been completed and independently verified. The reprocessing of the data confirms that the average weight of offshore workers in 2022 was approximately 96.56kg and the standard deviation for the population was 15.59kg.

Sensitivity analysis has been completed to estimate the impact of pre-processing of the Vantage-POB data set.to remove anomalous entries. The sensitivity analysis indicates that the impact on average weight and standard deviation is estimated to be very small, given that the objective of data processing is to establish new design values for assessing the suitability of lifeboats. Inclusion/ exclusion of anomalous data points only varies the estimates weight of the whole offshore population by a few tens of grammes.

International mobile accommodation unit operators, Prosafe Offshore and Floatel International have kindly provided recent weight data from 2023/24 associated with the helicopter transport of personnel to and from their accommodation installations. Their datasets provide further confirmation that the current trend in increasing offshore weight is valid. Recorded average weights from these operations match with predictions based on Vantage-POB 2022 weight data.

Whilst the average offshore weight has clearly increased significantly from 2008 to 2022, there is no supporting information to confirm that past trends in weight gain will continue in a linear fashion in future years. Therefore, whilst it is appropriate to set new design weights for lifeboats that are higher than the 2022 average population weight, it is recommended that Duty Holders and lifeboat manufacturers are cautious when predicting into the future. CPOGS recommends that average data weight is only projected forward a maximum of five years in the majority of cases.

The suggested methodology for calculating new design weights for lifeboats has been described in detail in this report. The design weight for lifeboats is known to vary in relation to the nominal capacity of the lifeboat, which is the marine equivalent of the ‘small aeroplane’ problem. Therefore, a range of practical design weights are presented for consideration in this report based on five different representative lifeboat sizes and a linear weight projection to 2027. The data is presented in Table 3.1 in Section 3.5.1.

For the smallest lifeboats with nominal occupancy of 15 to 24 personnel, the recommended design value is 112.4kg. For the largest lifeboats with nominal occupancy of more than 100 personnel, the proposed design value is 107.85kg. These values are 10kg higher than the design value of 98kg published in 2008 by the UK HSE.

It is recommended that both the OEUK and the UK offshore industry continue monitoring offshore weight data to determine how trends in offshore weight continue to evolve.

With respect to the evaluation of lifeboats on existing installations, guidance has been provided to Duty Holders on how to calculate individual design values that are suitable and appropriate for their own operations.

It is recommended that all Duty Holders gather important installation-specific data before calculating their own level of residual risk exposure. This information includes the following:

- The actual measured weight of each lifeboat using a load cell.
- The offshore weight data for their own installation population.
- The weights of mandatory PPE required during evacuation.
- The remaining lifetime of the installation.

It may also be necessary to add an allowance for any modifications that may be necessary to the lifeboats in order to increase the load capacity of lifebelts above the present 100kg limit required by SOLAS and the LSA for IMO approved lifeboats. The lifeboat manufactures should be able to advise further in this respect and this requirement is likely to vary depending on the actual lifeboat model.

It is important to note that the results of the design value calculation for the lifeboats on each UK installation are likely to be different, based on the variation in the platform specific parameters. Duty Holders are recommended to consult with internal/ external subject matter experts as appropriate and complete their own assessments.

For existing installations where any POB reduction may create significant operational difficulties, it is recommended that Duty Holders also evaluate switching to an operating model where offshore personnel are actively allocated to lifeboats on the basis of their actual measured weight on arrival offshore. This change in lifeboat assignment strategy is not described in detail within this report but it could potentially maximise the platform POB above what can be achieved by recalculating design weights and continuing to randomly allocate personnel to their lifeboats.

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