Oil & Gas UK
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UK OFFSHORE COMMERCIAL AIR TRANSPORT HELICOPTER SAFETY RECORD (1981 – 2010)

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COMMERCIAL AIR TRANSPORT
HELICOPTER SAFETY RECORD
(1981 – 2010)

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UK OFFSHORE COMMERCIAL AIR TRANSPORT HELICOPTER SAFETY RECORD (1981 – 2010)

EXECUTIVE SUMMARY

This report for Oil & Gas UK is an update of the document originally published by the Health and Safety Executive (HSE) in 2003 and last updated by Oil & Gas UK in 2007. The original work which was supported by the Civil Aviation Authority (CAA) was commissioned in order to produce a safety record of United Kingdom Continental Shelf (UKCS) offshore helicopter operations and to make comparisons with various other modes of transport. This latest report is sponsored by the Oil & Gas UK Aviation Safety Technical Group (ASTG), the industry group tasked with providing management oversight for UK offshore helicopter safety.

Data covering the last 30 years (1981 to 2010) of UKCS offshore helicopter operations are available for analysis and comparison, and have been grouped into three 10-year inclusive periods as follows: 1981 to 1990, 1991 to 2000, and 2001 to 2010. It should be noted, however, that the data sets used to obtain accident rates for offshore helicopter operations are relatively small; hence caution is required when interpreting the results.

From 1981 up to year-end 2010, more than 54 million passengers had been transported to and from offshore installations on the UKCS. Nearly 6½ million sectors were flown consuming nearly 3 million flying hours.

During this time 8 fatal accidents claimed the lives of 110 offshore workers and flight crew. As a measure of current UKCS activity, just short of 124,000 sectors were flown in 2010 transporting almost a million passengers offshore and sector flight times averaged about 34 minutes.

During the first 20 years (1981 to 2000) 5 fatal accidents were recorded and during the last decade 2001 to 2010 there have been three. The most recent fatal accidents occurred in July 2002, December 2006 and April 2009. Catastrophic component failure was the primary cause of 4 accidents and another 4 were attributed to human factors.

34 non-fatal reportable accidents were recorded during the first 20 years of UKCS offshore helicopter operations, 26 in the period 1981 to 1990 and 8 in the period 1991 to 2000. Between 2001 and 2010 there were 7 non-fatal reportable accidents but, taking into account the corresponding rates for the three periods (see Table 3.18), it shows no real improvement over the last decade. This is disappointing considering the many safety initiatives that have been introduced in recent years.

Data for World–Wide and All North Sea offshore helicopter operations is available from the International Oil & Gas Producers Association (OGP), but is limited to the period 1995 – 2010. Table 1 overleaf compares the global fatal and non-fatal accident rates with UKCS helicopter operations during the period 1995 to 2010 with both fatal and non-fatal accident rates based on 100,000 flying hours / sectors (flight stages) flown.

For the period 1995 to 2010 the UKCS recorded 3 fatal accidents whereas 5 fatal accidents were recorded for all North Sea operations. Despite three tragic accidents in the last decade, UKCS fatal accident rate compares favourably with the All North Sea. Comparisons with the Worldwide fatal accident rate (double the

UK rate) is probably misleading due to the wide variety of global helicopter operations; whereas All North Sea operations are a better match for comparative purposes.

The 1995 to 2010 non-fatal reportable accident rate for flying hours for the UKCS is a little lower than the All North Sea figure and quite a bit less than Worldwide operations. However, the UKCS non-fatal accident rate for sectors flown is not quite half the rate for All North Sea and fractionally lower than Worldwide.

REGION	PERIOD	FATAL ACCIDENT RATES (Flying Hrs.)	NON-FATAL ACCIDENT RATES (Flying Hrs.)	NON-FATAL ACCIDENT RATES (Sectors)
All North Sea	1995 – 2010	0.21	1.07	0.75
Worldwide	1995 – 2010	0.57	1.48	0.52
UKCS	1995 – 2010	0.26	0.91	0.45

Table 1 - Comparison of UKCS Accident Rates with OGP Worldwide Average Fatal and Reportable Accident Rates 1995 to 2010

Comparing offshore helicopter operations with other forms of transport used in the UK (e.g. car, train, pedal cycle) provides a useful comparison with everyday experience. Using the latest available data (1995 to 2009) from Department for Transport (DfT) indicates that the safety record of offshore helicopter travel reasonably compares with other forms of commonly used land-based passenger transport apart from rail and car. See Table 2 below.

TRANSPORT MODE	1995 – 2004 AVERAGE
Air (UK Airline Operations)	0.003
Rail	0.27
Car	2.57
Two Wheeled Motor Vehicle	106.67
Pedal Cycle	34.6
Pedestrian	43.27
Offshore Helicopter	13.8*

Table 2 - Comparison of Average Passenger Fatality Rates per Billion Passenger Kilometres by Transport Mode 1995 to 2009

(* Offshore Helicopter average figure derived from UKCS offshore flights data not DfT Report)

Over the last 30 years UKCS offshore helicopter operations have progressively achieved a reasonable safety record. The same is true over the past 15 years when compared with similar oil & gas operations globally and with most forms of UK land-based passenger transport.

However, despite having a fleet of some of the most up-to-date and technologically advanced helicopters operating offshore on the UKCS, fatal accidents occurred in July 2002 (S76 in Leman Field), December 2006 (AS365 (Dauphin) at Morecambe Bay) and April 2009 (AS332 Super Puma Mk2 – off Peterhead). These tragic accidents should serve as a constant reminder to everyone that offshore helicopters operate in a hostile environment and because of this there is the need for continuous improvement to minimise, if not eliminate the risks.

1. INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION

The Health & Safety Executive (HSE) and Civil Aviation Authority (CAA) are responsible for regulating UK offshore health and safety and aviation safety respectively. The actual achievement of aviation safety is the responsibility of all those on whom the law places a duty of care and these include, but are not limited to, helicopter operators, flight crews, installation operators, offshore workers with helicopter / helideck duties and passengers.

Helicopter transport is primarily the CAA's area of regulatory responsibility whereas installations are the responsibility of HSE. However, in practice, both regulators share a common and practical interest for many aspects of offshore helicopter safety performance and are therefore jointly seeking continuous improvement. HSE Leaflet INDG219 (Rev 1, 11/05) sets out in more detail how offshore helicopter travel is regulated and the responsibilities and arrangements in place to ensure the safety of offshore helicopter operations.

Through the Aviation Safety Technical Group (ASTG), Oil & Gas UK as the lead oil & gas industry association brings together the principle stakeholders to monitor, maintain and, where required, improve UK offshore helicopter safety. In doing this Oil & Gas UK regularly consults at senior management level with the HSE, CAA, all the UK based Helicopter Operators, National Air Traffic Service (NATS), International Oil & Gas Producers Association (OGP), Maritime & Coastguard Agency (MCA), Helideck Certification Agency (HCA), oil and gas company representatives and others on offshore helicopter safety. ASTG is also the technical and operations specialist group that responds to the Helicopter Safety Steering Group (HSSG) [a Step Change in Safety Workgroup] to keep them properly informed about offshore flight safety matters and obtain the solutions and implement technologies that improve flight safety. All parties agree that offshore helicopter risk is a topic that needs continuous scrutiny.

There is a long held perception by the workforce that UKCS offshore helicopter operations are a "high risk mode of transport"; this is not matched by the statistical evidence**.** This led to HSE commissioning and publishing the initial "Safety Record Report" in 2003 to gain a better insight into offshore helicopter risk, including available safety performance data and the criteria used to measure it. This current report published by Oil & Gas UK simply updates the original "Safety Records" to the end of 2010.

The purpose of this study is to provide an accurate historical safety record for UK offshore helicopter commercial air transport operations over the period 1981 to 2010, and to compare fatal and non-fatal accident numbers and rates with other UK and worldwide aviation data and other forms of transport. It is hoped that this will provide a good foundation for assessing the risks of UKCS helicopter activities, and give good indicators of the overall performance and potential risks.

1.2 BACKGROUND

Offshore public transport helicopter flight statistics and reportable accident data are available for a period covering the 30 years of UKCS operations from 1981 to 2010.

From 1981 up to year-end 2010, more than 54 million passengers had been transported to and from offshore installations on the UKCS. Nearly 6½ million sectors were flown consuming nearly 3 million flying hours.

As a measure of current UKCS activity, just short of 124,000 sectors were flown in 2010 transporting almost a million passengers offshore and sector flight times averaged about 34 minutes.

Between 1981 and 2010, eight fatal accidents have claimed the lives of 110 offshore workers and flight crew whilst travelling in offshore helicopters. Catastrophic component failure was the primary cause of 4 accidents and another 4 were attributed to human factors.

There have also been two Helicopter Landing Officer (HLO) fatalities on offshore helidecks.

Occasionally, reportable non-fatal accidents have also occurred, just as they do in other aviation sectors. These have included lightning strikes, major airframe damage, loss of engine power, tail rotor damage and loss of flight control. In most of these cases only the helicopter has been damaged but, infrequently, these incidents have resulted in injury to personnel.

In the last decade, a large number of safety enhancements have been introduced to UKCS helicopter operations and they are described in Appendix 1 of this report. These enhancements have resulted from a number of industry led initiatives and research projects.

2. DATA SOURCES AND ANALYSIS

2.1 DATA SOURCES

The main data sources and references used for developing the UK offshore helicopter safety record are:

- CAA (Safety Investigation and Data Department) - UK Offshore Helicopters Annual Flight Statistics for the Period 1981 – 2006.
- From 2006 all the data has been provided by the UK based offshore helicopter operators British International, Bond, Bristow, CHC, and NHV.

This data sources include flight hours, sectors flown, passengers carried, fatal and reportable accidents, crew and passenger fatalities, etc.

Later in the report the following information sources have been referenced for comparative purposes:

- International Association of Oil & Gas Producers (OGP) – Safety Performance of Helicopter Operations in the Oil & Gas industry.
- Department for Transport – Transport Statistics Great Britain (TSGB) – Passenger casualty rates by mode 1995 – 2004 (published in 2006) and 2000 – 2009 (published in 2010). Extracts from Tables 1.7.

2.2 ANALYSIS

Using the available data, an analysis has been undertaken to establish the safety record for UKCS offshore oil and gas helicopter commercial air transport operations.

To allow this report to focus specifically on the passenger transport safety record the following occurrences have been excluded: helideck crew fatalities that have occurred on the helideck; offshore SAR flight fatal and non-fatal reportable accidents; flight crew fatalities that have happened during offshore positioning flights. In the analysis, rates for fatal and non-fatal reportable accidents have been confined only to those occurrences that relate specifically to helicopters carrying the offshore oil and gas workforce as passengers (such offshore oil and gas helicopter operations are defined by the Air Navigation Order as being commercial air transport).

It is recommended that helideck crew fatalities and the non-fatal reportable accidents excluded in this report should be included in risk assessments (e.g. QRA), if establishing “Individual Risk” for activities relating to offshore installations. Excluded offshore helicopter fatal accidents are listed in Tables 2.1and 2.2 below.

YEAR	OCCURRENCE	OUTCOME
1981	Bell 212 (G-BDIL) crashed into the sea in poor visibility during a mission to winch a casualty from a ship.	6 fatalities (all on board)
1982	Bell 212 (G-BJJR) crashed into the sea on approach to an oil rig to embark passengers (positioning flight).	2 Flight Crew fatalities
1992	Helideck accident on MS Mayo.	HLO fatality.
1992	Helideck accident on Viking 'B' platform.	HLO fatality.

Table 2.1 Helideck Crew Fatalities and Flight Crew Fatalities that Occurred During Offshore Positioning and SAR Flights

YEAR	OCCURRENCE	OUTCOME
1983	Sikorsky S61 crashed into the sea off the Scilly Isles	20 fatalities

Table 2.2 Excluded non-oil and gas industry offshore helicopter fatal accidents

3. UK OFFSHORE PUBLIC TRANSPORT HELICOPTER SAFETY RECORD

3.1 INTRODUCTION

This section deals with helicopter types, historical flight statistics and fatal and non-fatal reportable accidents that have occurred during UKCS offshore helicopter passenger transport flights. Data used in this section has been obtained from the CAA Safety Investigation and Data Department (SI&DD) UK Offshore Helicopters Annual Flight Statistics for the period 1981 – 2006. From 2006 all the data has been provided by the UK based offshore helicopter operators British International, Bond, Bristow, CHC, and NHV.

Where accident rates are shown in this section of the report, a base of 100,000 has been used for flying hours and sectors flown (flight stages). This is the figure generally used by the oil and gas industry and the CAA.

3.2 HELICOPTER TYPES

TYPE	WEIGHT CLASS	INTRODUCED	WITHDRAWN
Bell 212	Medium	Pre 1975	2000
Bell 214 ST	Heavy	1982	2006
Boeing BV234 (Chinook)	Extra Heavy	1980	1989
Eurocopter B105 (Bolkow)	Light	1977	2001
Eurocopter AS330 (Puma)	Medium	1977	1985
Eurocopter AS332 (Super Puma)	Heavy	1982	Still in Service*
Eurocopter AS365 (Dauphin)	Medium	1979	Still in Service*
Eurocopter EC155	Medium	2007	Still in Service
Eurocopter EC225	Heavy	2005	Still in Service
Sikorsky S58	Medium	Pre 1975	1980
Sikorsky S61	Heavy	Pre 1975	Still in Service
Sikorsky S76	Medium	1980	Still in Service*
Sikorsky S92	Heavy	2005	Still in Service
AgustaWestland AW139	Medium	2005	Still in Service
Westland 30	Medium	1982	1991
Westland Wessex 60	Medium	1975	1981

Table 3.1 Helicopter Types Used in UKCS Offshore Support

During the period 1981 to 2010 the helicopter types engaged in offshore service on the UKCS are shown in the above Table 3.1.

From Table 3.1 it can be seen that by 2010 the early North Sea helicopter types have been withdrawn from UKCS offshore flight operations with the exception of the ubiquitous Sikorsky S61N. Replacement by more modern aircraft started during the 1980's and continues today with the introduction of new aircraft types and technically advanced modern variants of the Super Puma, Dauphin and Sikorsky S76 (shown as * in Table 3.1).

Four brand new helicopter types have been introduced onto the UKCS since 2005 and eventually, as the fleet numbers increase, this will lead to further retirements of older aircraft.

Offshore helicopter types are categorised into the following Maximum Take-off Weight Authorised (MTWA) groups.

Extra Heavy Twin >20000 Kg (e.g. Chinook)

Heavy Twin >5700 Kg (e.g. Bell 214ST, Super Puma, EC225, S61 and S92)

Medium Twin 2730 to 5700 Kg (e.g. Dauphin, EC155, S76 and AW139)

Light Twin < 2730 Kg (e.g. Bo 105)

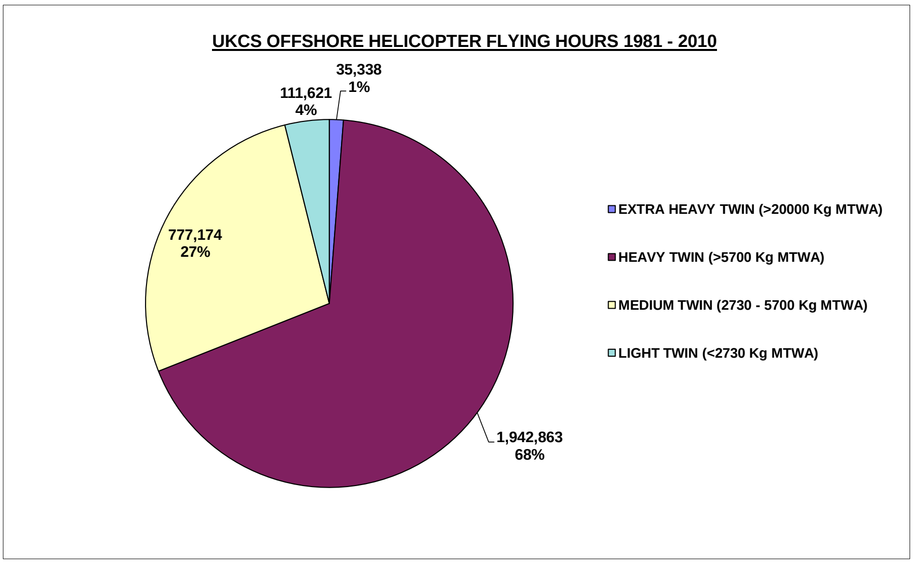
Since 2001, only Heavy and Medium Twin engine helicopters have been used on the UKCS.

It is important here to make a distinction between Heavy and Medium Twin helicopter operations. As a rule it can be said that Heavy Twins (e.g. AS332, EC225, S61 and S92) operate mainly out of Aberdeen or Scatsta and generally fly sectors (flight stages) with long flight times. Medium Twins (e.g. AS365, EC155, S76 and AW139) fly mainly out of the regional heliports (e.g. Blackpool, Humberside, and Norwich) and these aircraft record a high number of sectors (flight stages) with relatively short flight times.

3.3 HISTORICAL ACCIDENTS AND FLIGHT STATISTICS

The pie charts in Figure 3.2 provide a breakdown of UKCS offshore helicopter operations flying hours and sector (flight stage) activity by MTWA groups for the period 1981 to 2010.

Table 3.3 summarises all the UKCS offshore public transport fatal accidents referenced in this report.



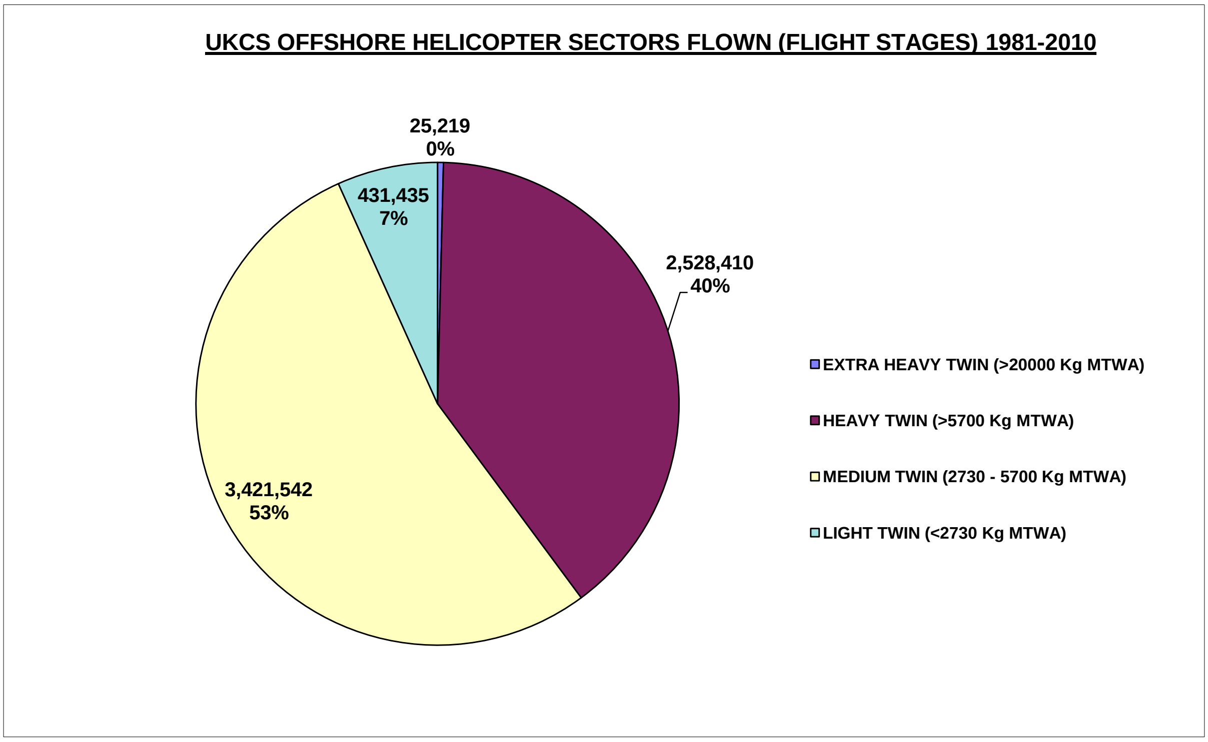


Figure 3.2 UKCS Offshore Helicopter Flight Statistics (1981 – 2010)

YEAR	AIRCRAFT TYPE	FATAL	INJURED	INCIDENT LOCATION	CAUSED BY	PRIMARY CAUSE
1981	Bell 212	1	0	Near Dunlin	During a daytime VMC flight, pilot encountered an area of reduced visibility and decided to return. As A/C entered turn at 200 ft control was lost. The A/C pitched 20deg nose up, climbed to 300 ft and lost all airspeed. A/C then rapidly yawed right and descended into sea. 13 Survivors.	Human Factors
1981	Westland Wessex Mk 60	13	0	Off Bacton	Power to main rotor gearbox lost. A/C went out of control and crashed into the sea. No survivors.	Total System Failure
1986	Boeing BV 234 LR	45	0	1.5 miles off Sumburgh	The A/C crashed in the sea 1.5 miles off Sumburgh and sank. A gear in the forward MRGB had failed through fatigue, causing the rotors to desynchronise and collide. 1 Survivor.	Main Rotor / Gearbox Failure
1990	Sikorsky S 61 N	6	0	Brent Spar Helideck	While manoeuvring to land on the Brent Spar helideck the tail rotor struck a crane. The aircraft descended onto the helideck and fell into the sea where it sank rapidly. 7 Survivors.	Human Factors
1992	Eurocopter AS 332 L / L1	11	1	Near Cormorant 'A'	A/C taking pax from platform to flotel 200m away. Access Bridge had been lifted due to adverse weather. A/C departed and then turned downwind with insufficient airspeed and descended rapidly into the sea and sank. 6 Survivors.	Human Factors
2002	Sikorsky S 76	11	0	Leman Field	Rotor Blade failure during approach to platform. Aircraft went out of control and crashed into the sea. No Survivors.	Main Rotor Blade Failure
2006	Eurocopter AS 365 N	7	0	Morecambe Bay	Following an approach to the North Morecambe platform the flight crew elected to "go-around" and the aircraft was subsequently heard to crash into the sea. No Survivors.	Human Factors
2009	Eurocopter AS 332 L2	16	0	Off Peterhead	Catastrophic failure of the MRGB. A/C went out of control and crashed into the sea. No survivors.	Main Rotor gearbox Failure

Table 3.3 UK Offshore Helicopter Fatal Accidents 1981 – 2010

3.4 OCCUPANT FATAL ACCIDENT RATE AND NON-FATAL REPORTABLE ACCIDENT RATE

Fatal and non-fatal reportable accident rates recorded for the MTWA groups for the period 1981 to 2010 are compared in Table 3.4 below. All offshore helicopter types that have been used on the UKCS are included and the rates are based on 100,000 flying hours and sectors (flight stages) flown.

	Per 100,000 Flying Hours		Per 100,000 Sectors (Flight Stages)	
HELICOPTER MTWA GROUP	**Occupant Fatal Accident Rate**	**Non-Fatal Reportable Accident Rate**	**Occupant Fatal Accident Rate**	**Non-Fatal Reportable Accident Rate**
Extra Heavy Twin (> 20000 Kg)	127.34	5.66	178.44	7.93
Heavy Twin (> 5700 Kg)	1.70	1.54	1.31	1.19
Medium Twin (<5700 Kg)	3.86	0.90	0.88	0.20
Light Twin (< 2730 Kg)	0.00	1.79	0.00	0.46
All UK Offshore Helicopters	3.84	1.43	1.72	0.64
Adjusted for Current Helicopter Types in Use	1.98	1.40	0.99	0.70

Table 3.4 Fatal and Non-Fatal Reportable Accident Rates by Helicopter MTWA Groups 1981 – 2010

With 45 fatalities, the Extra Heavy Twin (Chinook) accident in 1986 dominates the overall fatal accident rate for both flying hours and sectors flown. Since 1989 this aircraft type has not flown offshore in the UK and it accounts for only a very small proportion of the total flying hours between 1981 and 2010 (less than 1%).

By comparison, Light Twins have a significantly better safety record with no fatalities recorded. However, it should be borne in mind that Light Twins were withdrawn from offshore service in 2001 and only account for a small number (about 4%) of the total flying hours between 1981 and 2010.

The other two weight classes are the mainstay of UKCS helicopter operations and the safety performance of Medium Twins is significantly better than Heavy Twins in terms of the fatal accident rate for sectors flown (flight stages). However, this performance contrasts with the fatal accident rate for flying hours where Medium Twins are over twice that of Heavy Twins.

The ratio of flying hours to sectors flown by Medium Twins is over 4:1 and is significantly higher than Heavy Twins at a ratio of 1.3:1. These ratios appear to account for the significant fatal accident rate number differences between the weight classes which in turn suggest that accidents are more closely correlated to sectors than flying hours.

It is also interesting to note that the occupant fatal accident rate figures for all helicopter types flown on the UKCS over the last 30 years are approximately double the occupant fatal accident rate figures for the current helicopter types in use. However, the non-fatal reportable rates are broadly similar.

3.5 UK OFFSHORE HELICOPTER SAFETY RECORD

3.5.1 Introduction

This section analyses the UKCS Offshore Safety Record for the 30 years of UK offshore helicopter operations from 1981 to 2010 inclusive.

For comparative purposes the data have been broken down into the three 10-year periods of 1981 to 1990, 1991 to 2000 and 2001 to 2010. For each period the flight statistics, fatal and non-fatal accidents and their causes are given along with key indicators showing where major offshore helicopter flight safety initiatives have been introduced. All helicopter types are included and an interpretation of the available information is set out in the following sections for consideration.

3.5.2 The Years 1981 to 1990

Table 3.5 below shows the flight statistics for this period.

Flight Hours		Sectors		Passengers Carried	
Total	Yearly Average	Total	Yearly Average	Total	Yearly Average
1,158,343	115,834	2,721,469	272,146	19,609,057	1,960,905

Table 3.5 UKCS Offshore Helicopter Flight Statistics 1981 – 1990

It can be seen from the above table that an average of just over 270,000 sectors (flight stages) was flown and a little over 1.9 million passengers were carried each year.

Table 3.6 below shows the occupant fatal and non-fatal reportable accident rates for the period 1981 to 1990.

Per 100,000 Flying Hours		Per 100,000 Sectors (Flight Stages)	
Occupant Fatal Accident Rate	Non-Fatal Reportable Accident Rate	Occupant Fatal Accident Rate	Non-Fatal Reportable Accident Rate
5.61	2.24	2.39	0.96

Table 3.6 Fatal and Non-Fatal Reportable Accident Rates 1981 – 1990

Occupant Fatal Accident Rates recorded were 5.61 and 2.39 per 100,000 flying hours and sectors flown (flight stages) respectively. During this period there were 4 fatal accidents that accounted for the lives of 59 offshore workers and 6 flight crew (see Figure 3.7 below). Two were caused by catastrophic component failure and two were attributed to human factors.

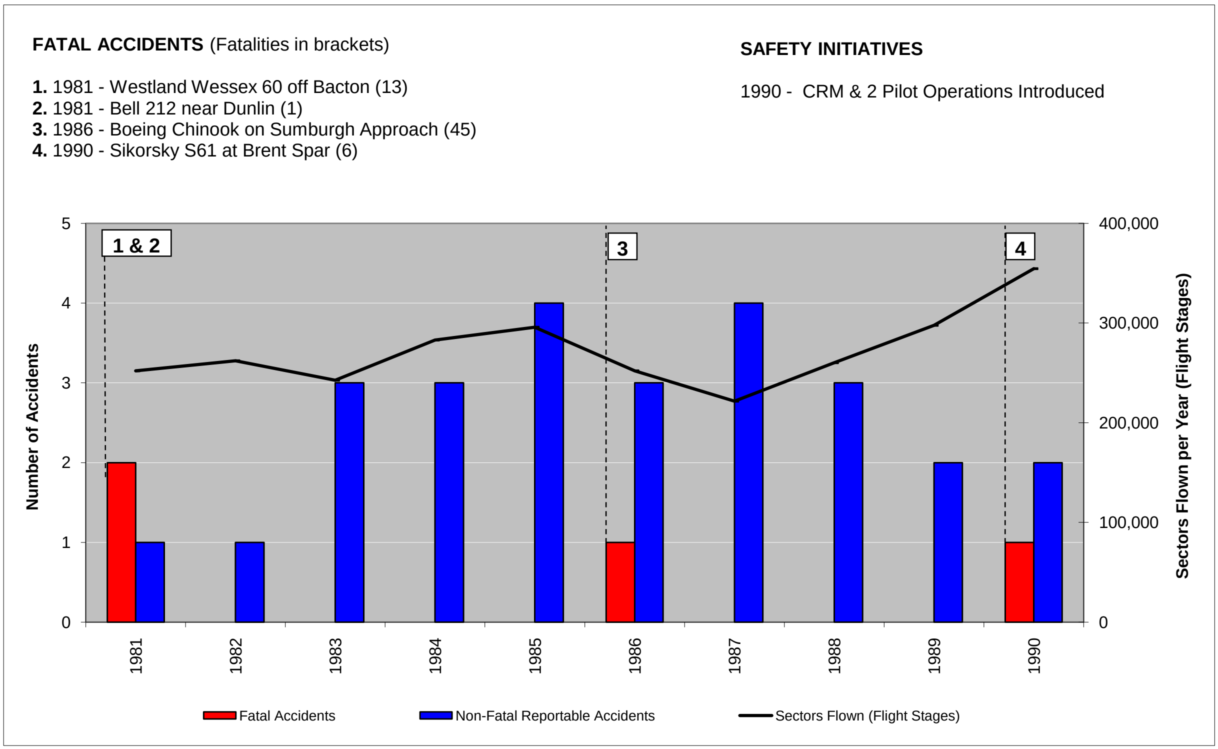


Figure 3.7 UKCS Offshore Helicopter Safety Record 1981 – 1990

There were also 26 non-fatal reportable accidents giving Reportable Accident Rates of 2.24 and 0.96 per 100,000 flying hours and sectors flown (flight stages) respectively. The causes of non-fatal reportable accidents during this period are listed in Table 3.8 below.

13 component / system failures or defects and 6 defective maintenance events accounted for the majority of the accidents during the period.

	Primary Cause	1981 – 1990
People / Machine	Component / System – Failure / Defect	13
	Human Factors	3
	Loss of Control	0
	Defective Maintenance	6
External Influences	Weather	0
	Helideck Turbulence / Exhaust Plumes	2
	Excess Vessel Motions	1
	Other Causes	1

Table 3.8 Causes of UK Offshore Helicopter Non-Fatal Reportable Accidents 1981 – 1990

3.5.3 The Years 1991 to 2000

Table 3.9 below shows the flight statistics for this period.

Flight Hours		Sectors		Passengers Carried	
Total	Yearly Average	Total	Yearly Average	Total	Yearly Average
972,627	97,262	2,257,661	225,766	20,524,894*	2,052,489

*From 1994, EC regulations required only the reporting of flight and sector activity; therefore the figures for passengers carried are estimates.

Table 3.9 UKCS Offshore Helicopter Flight Statistics 1991 – 2000

From the table it can be seen that an average of just under 225,000 sectors (flight stages) were flown and a little over 2 million passengers were carried each year. Table 3.10 below shows the occupant fatal and non-fatal reportable accident rates for the period.

Per 100,000 Flying Hours		Per 100,000 Sectors (Flight Stages)	
Occupant Fatal Accident Rate	Non-Fatal Reportable Accident Rate	Occupant Fatal Accident Rate	Non-Fatal Reportable Accident Rate
1.13	0.82	0.49	0.35

Table 3.10 Fatal and Non-Fatal Reportable Accident Rates 1991 – 2000

Occupant Fatal Accident Rates recorded were 1.13 and 0.49 per 100,000 flying hours and sectors flown (flight stages) respectively. During this period there was 1 fatal accident (attributed to human factors) that accounted for the lives of 10 offshore workers and 1 flight crew member bringing the total over 20 years to 76 (see Figure 3.11 overleaf).

There were also 8 non-fatal reportable accidents bringing the total to 34, and giving Reportable Accident Rates of 0.82 and 0.35 per 100,000 flying hours and sectors flown (flight stages) respectively.

The causes of non-fatal reportable accidents during this period are listed in Table 3.12 overleaf.

A total of 3 weather related incidents (e.g. lightning strikes) and 2 component or system failures / defects accounted for the largest proportion of accidents during the period.

In Figure 3.11 overleaf it can be seen that several significant safety initiatives were introduced during this period; these are discussed in more detail in Appendix 1.

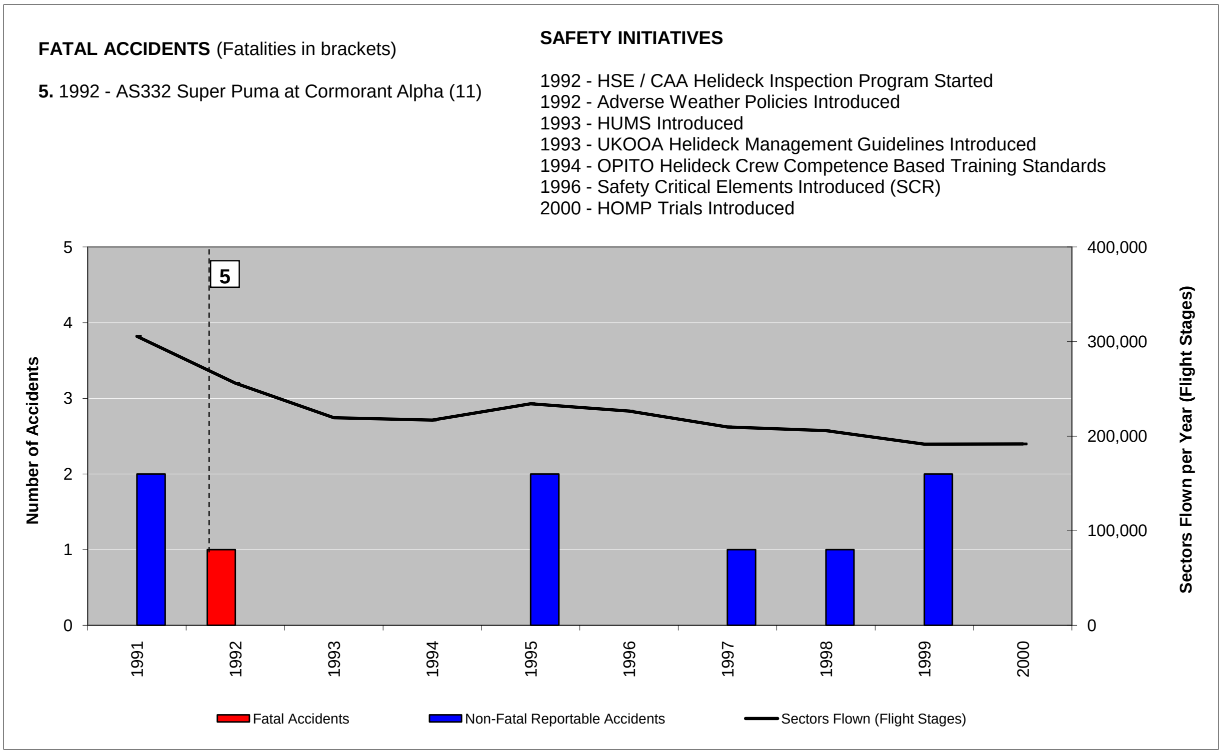


Figure 3.11 UKCS Offshore Helicopter Safety Record 1991 – 2000

	Primary Cause	1991 – 2000
People / Machine	Component / System – Failure / Defect	2
	Human Factors	1
	Loss of Control	0
	Defective Maintenance	1
External Influences	Weather	3
	Helideck Turbulence / Exhaust Plumes	1
	Excess Vessel Motions	0
	Other Causes	0

Table 3.12 Causes of UK Offshore Helicopter Non-Fatal Reportable Accidents 1991 – 2000

3.5.4 The Years 2001 to 2010

Table 3.13 below shows the flight statistics for this period.

Flight Hours		Sectors		Passengers Carried	
Total	Yearly Average	Total	Yearly Average	Total	Yearly Average
736,026	73,602	1,427,476	142,747	14,247,173*	1,424,717

*From 1994, EC regulations required only the reporting of flight and sector activity, therefore the figures for passengers carried are estimates up to 2006.

Table 3.13 UKCS Offshore Helicopter Flight Statistics 2001 – 2010

It can be seen from the above table that on average a little over 142,000 sectors (flight stages) were flown with a little over 1.4 million passengers carried each year.

Table 3.14 below shows the occupant fatal and non-fatal reportable accident rates for this period.

Per 100,000 Flying Hours		Per 100,000 Sectors (Flight Stages)	
Occupant Fatal Accident Rate	Non-Fatal Reportable Accident Rate	Occupant Fatal Accident Rate	Non-Fatal Reportable Accident Rate
4.62	0.95	2.38	0.49

Table 3.14 Fatal and Non-Fatal Reportable Accident Rates 2001 – 2010

Occupant Fatal Accident Rates recorded were 4.62 and 2.38 per 100,000 flying hours and sectors flown (flight stages) respectively. During this period there were three fatal accidents that accounted for the lives of 28 offshore workers and 6 flight crew bringing the total over 30 years to 110 (see Figure 3.15 below).

There were also 7 non-fatal reportable accidents bringing the total to 43 and giving non-fatal Reportable Accident Rates of 0.95 and 0.49 per 100,000 flying hours and sectors flown (flight stages) respectively.

The causes of non-fatal reportable accidents during this period are listed in Table 3.16 overleaf.

Human factors (3) and weather related occurrences (e.g. 2 x lightning strikes) accounted for most of the incidents during the last decade.

In Figure 3.14 below it can be seen that more safety initiatives were introduced during this period and these are discussed in more detail in Appendix 1.

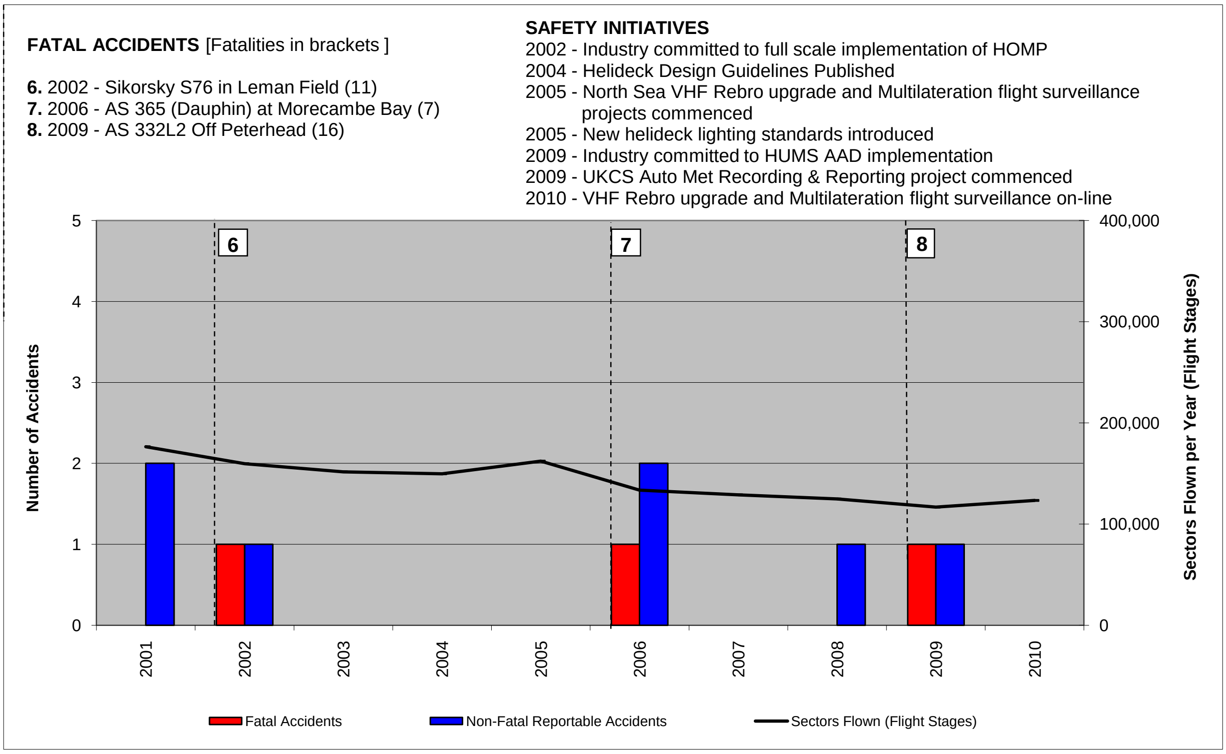


Figure 3.15 UKCS Offshore Helicopter Safety Record 2001 – 2010

	Primary Cause	2001 – 2010
People / Machine	Component / System – Failure / Defect	1
	Human Factors	3
	Loss of Control	0
	Defective Maintenance	0
External Influences	Weather	2
	Helideck Turbulence / Exhaust Plumes	0
	Excess Vessel Motions	1
	Other Causes	0

Table 3.16 Causes of UK Offshore Helicopter Non-Fatal Reportable Accidents 2001 – 2010

3.6 ASSESSMENT OF UK OFFSHORE HELICOPTER SAFETY RECORD 1981 - 2010

The overall and yearly average flying hours, sectors flown and passengers carried for the past 30 years are given in Table 3.17 below.

Flight Hours		Sectors		Passengers Carried	
Total	Yearly Average	Total	Yearly Average	Total	Yearly Average
2,866,996	95,566	6,406,606	213,553	54,381,124*	1,812,704

*From 1994, EC regulations required only the reporting of flight and sector activity; therefore the values for passengers carried are estimates up to 2006.

Table 3.17 UKCS Offshore Helicopter Flight Statistics 1981 – 2010

From the above table it can be seen that, from 1981 up to year-end 2010, just over 54 million passengers were transported to and from offshore installations on the UKCS. Just less than 6½ million sectors were flown taking nearly 2.9 million flying hours. Between 1981 and 2010 eight fatal accidents claimed the lives of 110 offshore workers and flight crew whilst travelling in offshore helicopters.

During the period 1981 – 1990 UKCS helicopter activity steadily increased year on year in response to the developing needs of the oil & gas industry and as the decade progressed toward its peak in 1990, modern helicopters were being introduced to replace some of the older types that had been involved in fatal accidents in earlier years. Ironically in the middle of the decade, and at a time when there was a slight dip in offshore activity, it was one of the newer types that crashed (a Chinook) and accounted for the single highest number of fatalities (45) recorded on the UKCS. This was also the decade that recorded the highest number of non-fatal reportable accidents.

1991 – 2000 was a period when UKCS helicopter activity started to slowly decrease year on year, after the 1990 peak. For about three years UKCS activity declined fairly sharply; then levelled-out for the rest of the decade. At the start of the decade a single fatal accident claimed 11 lives; but thereafter, the North Sea enjoyed its longest spell (9 years) without recording another fatal accident until 2002. Also during this decade there was a marked decline in the number of non-fatal reportable accidents.

From 2001 to the end of 2010 there was continuing decline in UKCS helicopter activity in the first couple of years. Thereafter it “flat lines” to mid decade until there is a small dip and then it “flat lines “again to the end of the decade. Tragically, during the last decade there have been three catastrophic fatal accidents; one in 2002, another in 2006 and the most recent in 2009. All 34 souls on board the three helicopters were lost.

During the last decade the number of UKCS non-fatal reportable accidents has remained at the same low level as the previous decade.

	Per 100,000 Flying Hours		Per 100,000 Sectors (Flight Stages)	
Period	**Occupant Fatal Accident Rate**	**Non-Fatal Reportable Accident Rate**	**Occupant Fatal Accident Rate**	**Non-Fatal Reportable Accident Rate**
1981 – 1990	5.61	2.24	2.39	0.96
1991 – 2000	1.13	0.82	0.49	0.35
2001 – 2010	4.62	0.95	2.38	0.49
1981 – 2010	3.84	1.43	1.72	0.64

Table 3.18 Fatal and Non-Fatal Reportable Accident Rates 1981 – 2010

Table 3.18 above shows that for the first decade 1981 -1990 fatal accident rates are the highest recorded on the UKCS. This is mainly due to the Chinook accident in 1986 and the corresponding large scale loss of life. Non-fatal reportable accident rates during the decade are also the highest rates recorded for the UKCS. The figures for this period may be accounted for by rapid scaling up of UKCS offshore helicopter operations to serve a fast expanding oil and gas industry, coupled with utilising a mix of old and new airframe types at the time.

The second decade 1991 to 2000 shows a marked improvement in safety performance with fatal accident rates (flight hours) reduced by nearly 80% and non-fatal reportable occurrences reduced by nearly 65%. This improvement could simply be a function of retiring the old helicopter types and having a maturing offshore helicopter operation using modern types, several of which are still in service today.

However, during the 1990's industry stakeholders also introduced several significant safety initiatives and funded and conducted much research into improving offshore helicopter safety. It is more likely that positive outcomes from the flight and helideck safety focussed initiatives and research activities were instrumental in achieving these significant improvements.

During the last period 2001 to 2010, a time when offshore helicopter activity has markedly reduced in scale from that of previous decades, more safety initiatives and research projects have either been introduced or have come to fruition. However, the safety performance figures have deteriorated with a 75% increase in fatal accident rates which are accounted for by the catastrophic fatal accidents in 2002, 2006 and 2009 with total loss of occupant lives.

However, by way of comparison, non-fatal reportable accident rates (flight hours and sectors) have only marginally increased from the low levels recorded in the previous decade.

Considering fatal and non-fatal reportable accident rates for the last thirty years as a whole, compared with the 1980's there was a marked overall improvement in safety performance in the 1990's. Since the start of the new millennium the overall safety performance figures over the past 10 years have deteriorated due to fatal accident rates that are approaching 1980's levels yet, non-fatal accident rates remain at a low level similar to the previous decade.

Keeping these accident statistics in proper perspective is very important, so it should be noted that two of the fatal accidents were caused directly as a result of 'unannounced' catastrophic component failures that could have happened on the helicopter types involved at anytime and anywhere in the world.

Table 3.19 below compares the two elements of people / machine and external influences for non-fatal reportable accidents.

	Primary Cause	81 - 90	91 - 00	01 - 10	81 - 10
People / Machine	Component / System – Failure / Defect	13	2	1	16
	Human Factors	3	1	3	7
	Loss of Control	0	0	0	0
	Defective Maintenance	6	1	0	7
Total		**22**	**4**	**4**	**30**
External Influences	Weather	0	3	2	5
	Helideck Turbulence / Exhaust Plumes	2	1	0	3
	Excess Vessel Motions	1	0	1	2
	Other Causes	1	0	0	1
Total		**4**	**4**	**3**	**11**
All Causes		26	8	7	41

Table 3.19 Breakdown of Causes of UK Offshore Helicopter Reportable Accidents 1981 – 2010

Component / system – failure / defects were the predominant cause of occurrences in the period 1981 to 1990 followed by defective maintenance and human factors.

During the years 1991 to 2000 three weather related occurrences dominate the numbers but noticeably, there was a dramatic decrease in component / system – failure / defects. Defective maintenance and human factor occurrences also declined during the same period. Realistically, this may be the result of introducing some new helicopter types and several safety initiatives on the North Sea during this period; along with reaping the benefits from two pilot operations and crew resource management (CRM) training introduced in the previous decade.

In the last decade 2001 to 2010, people / machine events have been reduced to one component / system – failure / defects but there has been a marginal increase in human factor occurrences. No doubt the introduction of HUMS in the mid 1990's and its use across the UK offshore fleet has made a significant contribution toward monitoring the condition of critical components and ensuring their timely removal prior to failure. Also the continuing high quality crew training and introduction of HOMP across the UK offshore fleet appears to have paid dividends in controlling the number of Human Factor events that might ultimately lead to a reportable occurrence.

External influences have been the cause of the most significant occurrences in the last decade and most of these have been weather related. The two weather related occurrences were lightning strikes which resulted in extensive airframe / component damage.

4. COMPARISON WITH OTHER ACTIVITIES

4.1 INTRODUCTION

In an effort to put the passenger risk associated with offshore helicopter transport into a more meaningful context, the safety records of various forms of travel have been collated and compared. It should be noted that helicopter travel offshore is, in many respects, a unique operation because flights are to remote installations and vessels, and much of the flight takes place over water. Also, passengers are equipped with survival suits and other aids for their journey and undergo survival training. Comparing activities that differ in environment and nature can be difficult and it is therefore worth noting that:

- Fixed wing airline aeroplane operations are not truly comparable with public transport helicopter operations because there are distinct differences between the operating regimes for fixed wing and rotary wing aircraft. Helicopters conduct operations that fixed wing aircraft cannot.

- Comparing offshore helicopter activities directly with onshore public transport helicopter activities can be misleading because the types of operation, types and size of helicopter (and hence level of equipment fit), operating environment and passenger exposure are quite different.

- Achieving accurate and meaningful comparisons between UK offshore helicopter operations and similar activities around the world is not always straightforward. This is due in part to the incompleteness of overseas data, the variable operating environments encountered (e.g. harsh vs. benign weather – UK operations are conducted in a harsh weather environment), and differences in reporting criteria.

- Unlike most other forms of transport, the size of the database for offshore helicopter passenger transport operations is very small in statistical terms. This means that apparent patterns in the data could be the result of random chance rather than any systematic cause. In addition, a single accident involving an offshore helicopter will have a proportionally more marked effect on the statistics than will a single accident involving a transport type having a larger database (e.g. aeroplanes, cars and trains).

The information in the following sections is included to assist readers reach their own conclusions.

4.2 COMPARING UKCS WITH WORLD-WIDE OFFSHORE HELICOPTER OPERATIONS

Some comparisons between UKCS and worldwide offshore helicopter operations safety performance can be made using data available from the International Association of Oil & Gas Producers (OGP).

The data available from OGP covers a 16-year period from 1995 to 2010. OGP's Aviation Sub-Committee has been collecting worldwide oil industry helicopter data since 1994, but advises in their reports that there are countries for which the accumulated operational data is incomplete, particularly in earlier years.

OGP reporting is based on 100,000 flying hours and sectors (flight stages) and deals with occupant fatalities, which includes passengers and crew.

In this section it should be noted that Worldwide and All North Sea data is extracted directly from tables in OGP reports, whereas the UKCS data used for comparison is derived from the same sources used in Section 3. In OGP reports, figures quoted for Worldwide cover all global activities including All North Sea, which in turn includes UKCS activities.

Table 4.1 overleaf gives the annual statistical data for fatal and reportable accident rates per 100,000 flying hours and sectors for UKCS, All North Sea and Worldwide offshore operations from 1995 to 2010.

Table 4.2 below summarises the averaged data for each region for the 16-year period 1995 – 2010. During this period, the UKCS recorded 3 fatal accident whereas 5 fatal accidents were recorded for all North Sea operations. Despite three tragic accidents in the last decade, UKCS fatal accident rate compares favourably with the All North Sea. Comparisons with the Worldwide fatal accident rate (double the UK rate) is probably misleading due to the wide variety of global helicopter operations; whereas All North Sea operations are a better match for comparative purposes.

The 1995 to 2010 non-fatal reportable accident rate for flying hours for the UKCS is little lower than the All North Sea figure and quite a bit less than Worldwide operations. However, the UKCS non-fatal accident rate for sectors flown is not quite half the rate for All North Sea and fractionally lower than Worldwide.

REGION	PERIOD	FATAL ACCIDENT RATES (Flying Hrs.)	NON-FATAL ACCIDENT RATES (Flying Hrs.)	NON-FATAL ACCIDENT RATES (Sectors)
All North Sea	1995 – 2010	0.21	1.07	0.75
Worldwide	1995 – 2010	0.57	1.48	0.52
UKCS	1995 – 2010	0.26	0.91	0.45

Table 4.2 Comparison of UKCS Accident Rates with OGP Worldwide Average Fatal and Reportable Accident Rates 1995 to 2010

	UKCS			ALL NORTH SEA			WORLDWIDE		
Year	Fatal Acc. Rate per 100,000 Flt Hrs	Accident Rate per 100,000 Flt Hrs	Accident Rate per 100,000 Sectors	Fatal Acc. Rate per 100,000 Flt Hrs	Accident Rate per 100,000 Flt Hrs	Accident Rate per 100,000 Sectors	Fatal Acc. Rate per 100,000 Flt Hrs	Accident Rate per 100,000 Flt Hrs	Accident Rate per 100,000 Sectors
1995	0.00	1.96	0.85	0.00	1.65	0.85	0.82	1.36	0.41
1996	0.00	0.00	0.00	0.00	1.26	1.20	0.85	1.82	0.59
1997	0.00	0.99	0.48	1.19	1.78	1.08	0.53	1.16	0.35
1998	0.00	1.03	0.49	0.00	0.61	0.39	0.58	1.07	0.36
1999	0.00	2.43	1.04	0.00	1.37	1.74	0.60	2.05	0.61
2000	0.00	0.00	0.00	0.00	0.68	0.41	0.78	1.79	0.60
2001	0.00	1.22	0.57	0.00	1.23	0.82	0.11	1.19	0.40
2002	1.23	1.23	0.63	0.65	1.96	1.09	0.32	1.16	0.41
2003	0.00	0.00	0.00	0.00	0.00	0.00	1.27	3.11	1.10
2004	0.00	0.00	0.00	0.00	0.00	0.00	0.70	1.41	0.52
2005	0.00	0.00	0.00	0.13	0.77	0.46	0.64	1.73	0.61
2006	1.39	2.79	1.50	0.72	2.90	2.01	0.45	1.79	0.63
2007	0.00	0.00	0.00	0.00	0.00	0.00	0.51	1.01	0.37
2008	0.00	1.41	0.80	0.00	1.53	0.97	0.51	1.12	0.40
2009	1.49	1.49	0.86	0.69	1.40	0.95	0.46	1.80	0.62
2010	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.40
Average 95 - 10	**0.26**	**0.91**	**0.45**	**0.21**	**1.07**	**0.75**	**0.57**	**1.48**	**0.52**

Table 4.1 UKCS and OGP Worldwide Offshore Helicopter Fatal and Reportable Accident Rates 1995 to 2010

4.3 OTHER TRANSPORT MODES

The Transport Statistics Great Britain (TSGB) published by the Department for Transport (DfT) provides data on yearly passenger casualty rates by mode. Accumulated data is available for the period 1995 up to 2009. The published rates are based on one billion (10^9) passenger kilometres.

For the period 1995 to 2009, annual comparisons with DfT statistics (fatality rates) are set out in Table 4.3 overleaf along with values calculated for UKCS offshore helicopter operations. The data given for air travel relate to passenger casualties in accidents involving UK registered airline aircraft in UK and foreign airspace.

Comparing offshore helicopter operations with other forms of transport used in the UK helps to set it in the more meaningful context of everyday experience.

Table 4.4 overleaf gives a summary of the 1995 to 2009 averages which indicate that the safety record of offshore helicopter travel is less favourable than UK airlines, rail and car travel. However, it is a lot better than pedal cycle and pedestrian travel and much less hazardous than travel by motorcycle.

2010 has not been included in the comparison because DfT data is not available at this time. In addition, since 1994 when new EC reporting requirements were introduced, base data are no longer collected for deriving offshore helicopter “passenger kilometres” values (also referred to as seat-km). Therefore, out of necessity (since 1994) the annual base figures used for offshore helicopter travel are estimates for passengers carried, kilometres flown and passenger kilometres. The offshore helicopter fatality rates for 2002, 2006 and 2009 were calculated using these estimates and (averaged) multipliers derived from the pre-1994 data.

Transport Mode	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Offshore Helicopter	0	0	0	0	0	0	0	42*	0	0	0	45*	0	0	120*
Air	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rail	0.2	0.4	0.5	0.4	0.9	0.3	0.3	0.4	0.2	0.2	0.1	0.1	0.1	0	0
Car	2.9	3	2.9	2.8	2.7	2.7	2.8	2.7	2.7	2.6	2.6	2.4	2.2	1.9	1.6
Motor cycles	110	108	119	112	113	122	112	111	114	105	97	107	97	89	84
Pedal Cycle	51	50	45	40	42	31	33	29	25	32	33	31	32	24	21
Pedestrian	57	56	57	50	50	49	47	42	41	35	36	36	36	31	26

Note: From 1994, EC regulations no longer require data on kilometres flown, passengers carried and passenger kilometres for offshore helicopters to be reported to the CAA.

Table 4.3 Comparison of Passenger Fatality Rates per Billion Passenger Kilometres by Transport Mode (DfT Statistics for the Period 1995 to 2009)

Transport Mode	1995 – 2009 Average
Offshore Helicopter	13.8*
Air	0.003
Rail	0.27
Car	2.57
Motorcycles	106.67
Pedal Cycle	34.6
Pedestrian	43.27

Table 4.4 Comparison of Average Passenger Fatality Rates per Billion Passenger Kilometres by Transport Mode 1995 to 2009

(* Offshore Helicopter figures derived from UKCS offshore flights data and travel estimates, not the DfT Report)

5. CONCLUSIONS

From 1981 up to year-end 2010, just over 54 million passengers were transported to and from offshore installations on the UKCS. Just less than 6½ million sectors were flown taking nearly 2.9 million flying hours. Between 1981 and 2010 eight fatal accidents claimed the lives of 110 offshore workers and flight crew whilst travelling in offshore helicopters.

During the period 1981 – 1990 UKCS helicopter activity steadily increased year on year in response to the developing needs of the oil & gas industry and as the decade progressed toward its peak in 1990, modern helicopters were being introduced to replace some of the older types that had been involved in fatal accidents in earlier years. Ironically in the middle of the decade, and at a time when there was a slight dip in offshore activity, it was one of the newer types that crashed (a Chinook) and accounted for the single highest number of fatalities (45) recorded on the UKCS. This was also the decade that recorded the highest number of non-fatal reportable accidents.

1991 – 2000 was a period when UKCS helicopter activity started to slowly decrease year on year, after the 1990 peak. For about three years UKCS activity declined fairly sharply; then levelled-out for the rest of the decade. At the start of the decade a single fatal accident at North Cormorant claimed 11 lives; but thereafter, the North Sea enjoyed its longest spell (9 years) without recording another fatal accident until 2002. In this decade there was a marked improvement in safety performance with fatal accident rates (flight hours) reduced by nearly 80% This improvement could simply be a function of retiring the old helicopter types and having a maturing offshore helicopter operation using modern types, several of which are still in service today. Also during this decade there was a marked decline in the number of non-fatal reportable accidents by nearly 65%. During the 1990's industry stakeholders introduced several significant safety initiatives and funded and conducted much research into improving offshore helicopter safety. It is likely that positive outcomes from the flight and helideck safety focussed initiatives and research activities were instrumental in achieving these significant improvements.

During the last decade and at a time when offshore helicopter activity has markedly reduced in scale from that of previous decades, more safety initiatives and research projects have either been introduced or have come to fruition. However, the safety performance figures have deteriorated with a 75% increase in fatal accident rates. Tragically, during the last decade there have been three catastrophic fatal accidents; one in 2002, another in 2006 and the most recent in 2009. All 34 souls on board the three helicopters were lost and occupant fatality rates for the last decade rose to 4.62 and 2.38 (flying hours and sectors flown respectively); uncomfortably similar to the accident rates recorded in the first decade. However, by way of comparison, non-fatal reportable accident rates (flight hours and sectors) have marginally reduced from the low levels recorded in the previous decade but non-fatal reportable accidents continue to occur on the UKCS, occasionally with serious injury being inflicted.

Direct comparisons of UKCS safety performance with Worldwide and All North Sea offshore helicopter operations can be made for the 16 year period 1995 to 2010.

During this period, the UKCS has recorded 3 fatal accidents whereas 5 fatal accidents were recorded for all North Sea operations.

Despite three tragic accidents in the last decade, UKCS fatal accident rate compares favourably with the All North Sea. Comparisons with the Worldwide fatal accident rate (double the UK rate) is probably misleading due to the wide variety of global helicopter operations; whereas All North Sea operations are a better match for comparative purposes.

The 1995 to 2010 non-fatal reportable accident rate for flying hours for the UKCS is a little lower than the All North Sea figure and quite a bit less than Worldwide operations. However, the UKCS non-fatal accident rate for sectors flown is not quite half the rate for All North Sea and fractionally lower than Worldwide.

While the limitations of the exercise are recognised, in an effort to put the passenger risk associated with offshore helicopter transport into a more meaningful context, the safety records of various other forms of travel have been collated and compared. The data available covering a 15 year period from 1995 to 2010 indicates that the safety record of offshore helicopter travel is less favourable than UK airlines, rail and car travel. However, it is a lot better than pedal cycle and pedestrian travel and much less hazardous than travel by motorcycle. This is due to the fatal offshore accidents in 2002, 2006 and 2009.

This study and its analysis demonstrate that, overall, UKCS offshore helicopter operations has a mixed safety record over the last 30 years. Although, over the past 10 to 15 years when compared with similar oil & gas operations globally and with most other forms of UK land-based passenger transport the UKCS safety record can be considered reasonable. This assessment should not provide any comfort to the UKCS aviation community because sadly, the last decade has been blighted by the loss of too many lives.

Since the beginning of oil and gas operations in the UK North Sea the longest fatal accident free period for UKCS offshore helicopter operations has been 9 years, from 1993 to 2001. However, despite having a fleet of some of the most up-to-date and technologically advanced helicopters operating offshore on the UKCS, fatal accidents occurred in July 2002, December 2006 and April 2009. These tragic accidents should serve as a constant reminder to everyone that offshore helicopters operate in a hostile environment and because of this there is the need for continuous improvement to minimise, if not eliminate the risks.

Additionally, non-fatal reportable accidents on the UKCS have been progressively reduced over the last 30 years, but continue to occur. This situation simply highlights the need for the UK oil and gas industry to continue to vigorously pursue current and future safety initiatives and research projects to further reduce risks.

A summary of safety initiatives and relevant research projects is shown in Appendix 1.

6. ABBREVIATIONS AND DEFINITIONS

A/C	Aircraft
ASTG	Aviation Safety Technical Group – a group formed under the chairmanship of Oil & Gas UK provides oversight for UK offshore helicopter safety. Members comprise senior managers from Bond Helicopters, Bristow, CHC, BIH, NHV, HSE, CAA, NATS, OGP, HCA, Apache, BP, Centrica, Perenco and Shell.
CAP	Civil Aviation Publication (published by the Civil Aviation Authority)
CRM	Crew Resource Management
DCR	Offshore Installations and Wells (Design and Construction, etc.) Regulations 1996
deg	degree
DfT	Department for Transport
Flight Hours	The time recorded from the moment a helicopter first moves under its own power to take-off until the moment it comes to rest after landing.
ft.	feet
HCA	Helideck Certification Agency
HOMP	Helicopter Operations Monitoring Programme
HUMS	Health and Usage Monitoring System
Flight Stage	The activity of one take-off and landing (see Sector)
MRGB	Main Rotor Gearbox
MTWA	Maximum Take-off Weight Authorised
Occupants	For the purposes of this report all souls on board are included (e.g. passengers and flight crew)
OGP	International Oil & Gas Producers Association
OPITO	Offshore Petroleum Industry Training Organisation
pax	Passengers
Reportable Accident	An occurrence associated with the operation of an aircraft which takes place between the time any person boards the aircraft with the intention of flight until such time as all persons have disembarked, including an aircraft sustaining damage or structural failure which adversely affects the structural strength, performance or flight characteristics of the aircraft and which would normally require major repair or replacement of the affected components.
SAR	Search and Rescue
Sector	The activity of one take-off and landing (the same as a flight stage).
UKCS	United Kingdom Continental Shelf
VMC	Visual Meteorological Conditions

APPENDIX 1 SAFETY IMPROVEMENTS AND INITIATIVES

Since the early 1980's many safety initiatives and improvements to UKCS helicopter operations have been funded and fully supported by industry and the regulators. Some of the major achievements are listed below but they have not been given any order of priority or importance.

- ***Regular reviews and periodic updating of CAP 437, Offshore helicopter landing areas – guidance on standards:***
  This key document is founded on the ICAO international standards and recommended practices, and provides the basic requirements applied to offshore helidecks by the regulators and helicopter operators to ensure they are fit for purpose.

- ***Health and Usage Monitoring Systems (HUMS):***
  HUMS was introduced on the UKCS in the early 1990's to reduce catastrophic component failures by providing information on operating limit exceedences and early detection of defects. From its inception HUMS was highly successful and is now widely acclaimed as an essential helicopter maintenance tool. It is also mandated by CAA for all UKCS Offshore helicopters. It should be noted that in respect of the fatal S76 accident in 2002 and the Super Puma Mk2 fatal accident in 2009, both caused by a catastrophic component failures, the latent defects would not have been identified by HUMS because detecting such failure modes is beyond current system capability. Research continues in order to widen the scope for monitoring more components.

- ***HUMS Advanced Anomaly Detection (AAD):***
  A program to implement HUMS AAD on the UKCS offshore helicopter fleet was started in 2009. AAD, the outcome of a successful CAA research project, is essentially an extension to HUMS analysis using data mining techniques to further enhance HUMS detection rates by seeking out anomalous occurrences that could signal the onset of failure. When implemented, HUMS detection rates may increase from about 65% to 85%.

- ***TCAS 2 Collision Avoidance System:***
  A program is under way on the UKCS to introduce an airborne collision avoidance system on all offshore helicopters. This system has the potential to eliminate conflictions between similarly equipped offshore helicopters and to reduce air miss opportunities with other aircraft.

- ***Improved standard of helidecks and equipment:***
  In the early 1990's a series of helideck surveys conducted by CAA on behalf of HSE identified many helideck and equipment deficiencies and non-compliances with regulations and codes of practice. The outcome from these surveys led to introduction of the BHAB Helideck Inspection regime (now known as the Helideck Certification Agency) to undertake routine helideck examinations and acceptance for flight operations on behalf of the helicopter operators.

- ***Improved helideck operating standards and guidelines:***
  In response to helideck operating deficiencies, highlighted during the HSE / CAA offshore helideck operations inspection programme, Guidelines for the Management of Offshore Helideck

Operations were developed by Industry and other stakeholders and first published by UKOOA in 1993. They are regularly reviewed and were last updated to Issue 6 and re-titled Guidelines for the Management of Aviation Operations in April 2011. They are published as a CD.

- ***Offshore flights restricted in poor weather conditions:***
  As a result of the findings of a fatal accident near Cormorant Alpha in 1992, industry introduced operating policies to improve the management of helicopter operations in adverse weather conditions.

- ***More competent helideck crews:***
  The training and competence of helideck crews was challenged in the early 1990's leading to industry and other stakeholders developing competence based training requirements.

- ***Greater focus on safe helidecks and helicopter operations:***
  An offshore helideck is a collection of systems, some of which are safety critical. Duty holders have to identify such safety critical systems and have them independently verified as required by The Offshore Installations and Wells (Design and Construction, etc.) Regulations1996. HSE Safety Notice 4/99 – Offshore Helideck Design and Operability was issued in September 1999 drawing attention to these requirements.

- ***The introduction of Crew Resource Management (CRM):***
  Helicopter operators, in conjunction with the CAA, developed and introduced systems to improve crew resource management. CRM training provides crews with skills for more efficient flight management. Progressively, since the late 1980's, multi-crewing and the use of all instrument rated pilots was introduced for UK offshore flights.

- ***North Sea VHF Rebro upgrade and introduction of "Multilateration" flight surveillance:***
  In late 2004, the UKOOA led Aviation Safety Technical Group (ASTG) initiated a joint project with National Air Traffic Service (NATS) to assess the efficiency and coverage of offshore helicopter VHF aeronautical communications and fight surveillance provided on the UKCS. The outcome of this review led to significant work and investment being made in order to upgrade and modernise offshore VHF aeronautical communications and, the development and installation of a new "Multilateration" flight surveillance system which will significantly enhance air traffic control on the UKCS. The new systems were completed and became operational in 2010 and, in particular, the wide area multilateration was welcomed by air traffic controllers as a surveillance tool that is the equivalent of radar.

- ***Meteorological Project:***

  In 2009 in response to a new CAP437 requirement, an Oil & Gas UK led project commenced to provide a UKCS automatic meteorological recording and reporting network to much improve the accuracy of weather information used by offshore helicopter flight crews. This project entails installing specialist meteorological equipment and software on designated hub installations and providing training for a large number of offshore personnel. The system should be fully operational by 2012.

Some of the above initiatives have been part of the extensive research into improving offshore helicopter flight safety that has been ongoing since the Helicopter Airworthiness Review Panel (HARP) Report was published by the CAA in 1984 (CAP 491) and, subsequently, the Review of Helicopter Offshore Safety and Survival (RHOSS) Report which was published in 1995 (CAP 641). Other research projects that have already contributed to improving offshore helicopter flight safety and those initiatives currently active, include:

- ***Helideck motions on floating platforms and vessels:***
  Since 1992 a significant amount of research has been carried out into the effects of the motion of helidecks on floating platforms and vessels on helicopters. The new motion severity index (MSI) that has been developed will better establish whether a helicopter can safely remain on a moving helideck. Establishment of MSI-based helicopter operating limits is nearing completion.

- ***Environmental hazards around offshore platforms:***
  According to pilot opinion (CAA Paper 97009 refers) turbulence represents the greatest safety hazard and largest source of flight deck workload for crews landing on offshore helidecks.

  A research project, funded jointly by the HSE and CAA and reported in CAA Paper 99004, investigated the nature and extent of environmental hazards around offshore helidecks, installations and vessels. Follow-on work to establish better aerodynamic criteria for validating helideck design is nearing completion.

- ***Helideck lighting:***
  On approach to an offshore helideck, the surrounding light pollution can hinder helideck location. Furthermore, existing helideck lighting systems can present a source of glare for helicopter pilots and often do not provide adequate visual cues for landing. Several CAA trials of new helideck lighting systems designed specifically to address these issues (e.g. green perimeter lighting and revised floodlighting) have been carried out over the last decade or so. They have proved very successful and to a large extent have now been adopted as international standards and introduced into UKCS service. Additional trials initiated in 2005 / 6 to further enhance visual aids for landing include the use of LED lighting systems for the helideck aiming circle and "H" are coming to a successful conclusion.

- ***Helicopter emergency flotation:***
  This project is directed at practical improvements in the crashworthiness of flotation equipment to enhance post water impact survivability, and to provide a fall-back side floating attitude in the event of capsize following a ditching. Hydrodynamic model tests of potential systems have been carried out and are reported in CAA Paper 97010. Escape trials from a side floating 'helicopter' have been successfully performed using a helicopter underwater escape trainer (HUET) and are reported in CAA Paper 2001/10. This research continues under the auspices of the European Aviation Safety Agency (EASA).

- ***Preparation of comprehensive Offshore Helideck Design Guidelines:***
  Offshore helideck design guidelines have been developed in response to one of the recommendations in CAA paper 99004 (see above) which identified that some offshore helideck and Installation operations can create problems that potentially affect flight safety.

  Problems may be caused by helideck layout and equipment deficiencies, structure-induced turbulence, hot gas plumes generated by turbines and flares, or the effects of wave-induced motions on helidecks on floating structures and vessels. These aspects often result in operating limits being imposed by helicopter operators. The Guidelines were published in June 2004.

- ***Helicopter Operations Monitoring Programme (HOMP):***
  Independent and continuous monitoring of flight operations allows helicopter operators to identify and address operational weaknesses (e.g. shortfalls in training or procedures), and obtain better information on operational difficulties caused by environmental factors such as weather and thereby minimise risks. HOMP trials were started in 2000 and were so successful that, in 2002, the industry committed to full-scale implementation. The original in-service trials of HOMP are reported in CAA Paper 2002/02.