CIVIL AVIATION AUTHORITY

CAA PAPER 97009

A QUESTIONNAIRE SURVEY OF WORKLOAD AND SAFETY HAZARDS ASSOCIATED WITH NORTH SEA AND IRISH SEA HELICOPTER OPERATIONS

CIVIL AVIATION AUTHORITY, LONDON

CAA PAPER 97009

A QUESTIONNAIRE SURVEY OF WORKLOAD AND SAFETY HAZARDS ASSOCIATED WITH NORTH SEA AND IRISH SEA HELICOPTER OPERATIONS

Mel James
Julia Scriven
Roger Green

CIVIL AVIATION AUTHORITY, LONDON, AUGUST 1997

ISBN 0 86039 714 9

Printed and distributed by
Westward Digital Limited, 37 Windsor Street, Cheltenham, England

Foreword

The research reported in this paper was funded by the Safety Regulation Group of the UK Civil Aviation Authority. The work was instigated at the DERA Centre for Human Sciences in response to Recommendation 4.1 of AAIB Aircraft Accident Report 2/93 (accident to Super Puma AS332L G-TIGH near the Cormorant 'A' platform on 14 March 1992), and the findings of the Helicopter Human Factors Working Group reported in CAA Paper 87007 (recommendation 4.2.5). The Helicopter Human factors Working Group was formed in response to Recommendation 1 of the Report of the Helicopter Airworthiness Review Panel (CAP 491).

The CAA concurs with the conclusions of the research, and this report will form the basis of discussions with the Industry aimed at addressing the problem areas highlighted. Although the purpose of the survey was to establish whether, and under what circumstances, the workload imposed by in-flight paperwork is excessive, the process of conducting the survey in an objective manner has generated a valuable database of pilots' views on a wide range of issues associated with offshore operations. This information is already being used to assist the CAA's safety research in the areas of helideck lighting and helideck environmental issues (e.g. turbulence), and further use of the data is anticipated. The CAA extends its gratitude to those pilots who took the time and trouble to complete the questionnaire.

Safety Regulation Group

23 July 1997

– INTENTIONALLY BLANK –

Contents

ANNEXES

Executive Summary

This study of North Sea and Irish Sea helicopter flight deck workload was carried out by the Defence Evaluation Research Agency (DERA) Centre for Human Sciences in conjunction with representatives from the helicopter operating companies, and was sponsored by the CAA. The stated aim of this study was to establish whether, and under what circumstances, the workload imposed by in-flight paperwork is excessive and to interpret these findings within the context of overall workload issues associated with North Sea and Irish Sea helicopter operations. This aim was achieved through in-depth interviews with 30 aircrew operating from Aberdeen and North Denes and through a comprehensive questionnaire survey of all aircrew who were holders of CAA licences employed in UK-based offshore operations.

The interview phase of the study investigated, in detail, the workload and safety concerns of aircrew, especially those relating to in-flight paperwork, and this information was used to devise the questionnaire used in this study. Questionnaires were distributed to 380 aircrew and a 74% return rate was achieved. This return rate was extremely high for a 'postal' survey and, for this reason, the opinions and attitudes collected should be regarded as highly representative of the target population.

The completion of in-flight paperwork was considered to be a frequent cause of high workload. Respondents flying Southern North Sea operations and those completing shuttle operations / multi-landings felt that paperwork caused high workload more frequently than those flying Northern operations or fewer landings. The completion of in-flight paperwork was judged to cause a safety hazard on some occasions, although many aircrew stated that it would usually be deferred, to be completed at a time when it would not compromise safety. Those flying single pilot operations reported the completion of in-flight paperwork as a more frequent cause of safety hazard than those in two pilot operations. The completion of in-flight paperwork was reported to affect monitoring, crew resource management, and general piloting tasks, and was considered to be far more demanding if shuttling, or if there were late changes, or if there was poor weather, or it was night, or if the crew were on approach to a rig.

Late changes to route or loads caused frustration and annoyance among aircrew and necessitated frequent changes to be made to completed paperwork. Although respondents felt that improvements could be made by information being giving earlier, or by educating the customer to the effects of late changes on their workload, or by better use of automation, many felt that flexibility was a key feature of their role and late changes were 'part of the job'. Other paperwork issues that adversely affected workload were the quantity of paperwork, duplication of entries, and the storage and handling of paperwork. Respondents felt that improvements could be made through reducing and standardising paperwork, having better storage facilities in the cockpit, and by computerising and automating some of the paperwork. Secondary factors that affected workload and related to paperwork completion were poor cockpit lighting, poor helicopter landing officer service, commercial pressures, and lack of standardisation across customers.

Ratings data, collected from the majority of respondents, indicated that the completion of paperwork was a frequent cause of high workload, coming below 'turbulence around platforms' and 'weather conditions' and above a large list of other factors. Since only limited action could be taken to manage the top two factors, the paperwork system would appear to be an area in which workload-reducing action could usefully be targeted to the benefit of aircrew. Paperwork was similarly placed when ratings of frequency of safety hazard were considered. However, other factors, not investigated using similar ratings scales, e.g. rostering, were also considered to cause frequent high workload and safety hazard. When questioned about factors that impacted on workload, paperwork was cited most frequently (by more than 70% of all respondents) and in the

list of major safety concerns it featured third highest, below 'dissatisfaction with the air traffic environment' and 'airworthiness'.

In conclusion, in-flight paperwork appears to be an area that causes frequent high workload, but because of its 'deferrable' nature, only presents a safety hazard occasionally. It is an area that could probably be improved more easily and cheaply than areas that have a greater impact on workload or safety, e.g. turbulence around platforms. Data from this study provide evidence of operations that would benefit most from improvements in this area, e.g. Southern North Sea operations, shuttling operations, and single pilot operations, and also provide evidence of factors that serve to make the completion of paperwork more arduous or hazardous, e.g. late changes, duplications, excessive quantities of paperwork, poor cockpit lighting, poor standardisation. This evidence may now be used to construct a set of considered and informed recommendations for improvements in this area.

Glossary of Terms/Abbreviations

AAIB	–	Air Accident Investigation Branch
AFCS	–	Automatic Flight Control System
ANOVA	–	Analysis Of Variance, a statistical test used to determine if there are differences between two or more groups in a set of data
CAA	–	Civil Aviation Authority
CHS	–	Centre for Human Sciences
C of G	–	Centre of Gravity
CRM	–	Crew Resource Management
DECCA	–	proprietary low frequency long range hyperbolic navigation system
DERA	–	Defence Evaluation and Research Agency
ETA	–	Expected Time of Arrival
GNS	–	Global Navigation system
GPS	–	Global Positioning System
HLO	–	Helicopter Landing Officer
HUMS	–	Health and Usage Monitoring System
IHUMS	–	Integrated Health and Usage Monitoring System
JAA	–	Joint Airworthiness Authority
manifest(s)	–	lists of passengers and/or cargo
Mean	–	the arithmetic mean, the average value in a set of data
met.	–	meteorological (weather)
Mode	–	the most frequently occurring value in a set of data
MSLS	–	Multi-Sector Load Sheet
n	–	sample size / number of respondents in a sample or sub-sample
Nav. / Flt. Log	–	official document for recording progress of aircraft flight
nm	–	nautical mile
NNS	–	Northern North Sea
Omega	–	VLF long range hyperbolic navigation system
RNAV1	–	Racal area navigation system
RNAV2	–	Racal area navigation system
S61	–	Sikorsky S61 helicopter
S76	–	Sikorsky S76 helicopter
SNS	–	Southern North Sea
SSLS	–	Single Sector Load Sheet
sd	–	Standard Deviation, a measure of the spread of data about their mean
TANS	–	Tactical Air Navigation System
vis.	–	visibility
VLF	–	Very Low Frequency
Workload	–	(in this context) a subjective experience of work demands. Workload is mediated by factors relating to the individual (internal factors) i.e. an individual's level of skill, ability, personality, physical condition (e.g. sleep deprived), stress level, general readiness to perform a task, and environmental (external) factors i.e. task complexity, time pressure, commercial pressures, time of day, temperature, vibration, etc. Workload is of interest because of its link with performance. Although there is no absolute definable relationship between workload and performance, in general terms, there is an optimum level of workload for any given task. If the workload is too high (or too low) performance will be affected adversely. Often emphasis is placed on high workload where individuals may feel that they have too much to do to perform optimally, however, it should also be borne in mind that too little to do (being bored) can also affect task performance.

– INTENTIONALLY BLANK –

1 INTRODUCTION

1.1 Purpose

1.1.1 The 1987 Report of the Helicopter Human Factors Working Group (CAA Paper No: 87007) identified a problem with "short inter-rig flights on the North Sea" involving excess workload generated by paperwork. The AAIB report on the Cormorant 'A' accident in March 1992 stated that "the current study within the CAA of cockpit workload should be given a high priority with a view to reducing the workload, in particular administrative matters, of flight crews whilst airborne or engaged in the shuttling task".

1.1.2 This study of North Sea and Irish Sea helicopter flight deck workload was carried out by the DERA CHS in conjunction with representatives from the helicopter operating companies and was sponsored by the CAA. The primary purpose of this study was to discover the extent to which in-flight paperwork contributes to the overall picture of flight deck workload, and whether it constitutes a safety hazard. This questionnaire survey examined a wide range of relevant topics in order to determine which factors contributed to high workload and safety hazards during routine operations, and how often. Consequently, a profile of the frequency with which factors contributed to high workload and safety hazards was produced which allowed the amount of workload imposed by in-flight paperwork and associated tasks to be viewed in context.

1.1.3 Pilots have various tasks to complete which involve paperwork, administration, and planning. These tasks may be conducted before, during, and after flights. The aspect of paperwork of interest to this study is that which is carried out during flight, i.e. between take-off from base and return to base. The definition of in-flight paperwork used for this study was 'the flight deck workload associated with the completion of paperwork in flight to meet legislative and commercial requirements'.

1.2 Background

1.2.1 Most readers will be familiar with the different circumstances in which UK-based offshore operations take place. However, it is important for those who are less familiar to understand a little of the background since this has a strong influence upon the interpretation of survey results.

1.2.2 UK-based offshore operations can generally be divided into two areas: Northern (including northern North Sea) and Southern (including southern North Sea, Irish Sea, and English Channel). Northern operations tend to be characterised by long distance sectors with only one or two landings per trip, adverse weather conditions, and a hostile environment. Southern operations tend to be characterised by shorter sectors with several landings per trip, better weather than Northern operations, and a less hostile environment.

1.3 Aim

1.3.1 To establish whether, and under what circumstances, the workload imposed by in-flight paperwork is excessive and to interpret these findings within the context of overall workload issues associated with North Sea and Irish Sea helicopter operations.

2 METHOD

2.0.1 The study was carried out in two parts; interviews and questionnaires. In order to ensure that the study tackled the relevant topic areas CHS interviewed, at length, 30 pilots from the major helicopter operating companies in Aberdeen and North Denes. These in-depth interviews provided CHS with a comprehensive description of the main factors contributing to pilot workload. The next stage was to quantify the frequency with which each factor contributed to high workload or safety hazards. This was achieved by means of a questionnaire study.

2.0.2 The questionnaire was comprehensive in its coverage of workload issues and was structured in nine discrete sections as follows:

(1) Background information on respondents, including details of their flying experience and the aircraft and equipment that they most frequently encountered.

(2) The type of operation for which respondents were answering the survey questions, e.g. from the viewpoint of single or two pilot operations.

(3) The aircraft: cockpit temperature; cockpit lighting; cockpit misting; other difficulties with cockpit visibility; layout of controls; displays; design of seat; immersion suits; and other personal equipment.

(4) The effects of aircraft handling characteristics on workload.

(5) Area navigation facilities on board the aircraft: ease of use; timeliness and quality of information provided; navigation workload; whether respondents had used types of navigation equipment other than the type fitted to their aircraft; and whether they had any preferences for specific navigation systems.

(6) Supporting services: pre-flight planning aids; meteorological (met.) information when flight planning; met. when airborne; air traffic services en-route to platforms; air traffic services in the vicinity of platforms; airfield or helideck conspicuity aids.

(7) Activities and conditions during flight: weather conditions; the activity of calculating load or fuel requirements; filling out paperwork; the design of the in-flight Nav. log / Flt log; duplication of entries required of paperwork; late changes in load; timeliness of receipt of information required to complete paperwork; suggestions to reduce workload caused by late changes to expected loads; the overall effect of in-flight paperwork on workload; how much workload would improve if late changes were eliminated; the impact of in-flight paperwork on other aspects of the trip; aspects of paperwork that could usefully be replaced by an automated system; storage and handling of paperwork in the cockpit; other difficulties with paperwork; suggestions to reduce these difficulties; experience of using other systems of paperwork that are better than the currently used systems; suggestions for improvement to paperwork.

(8) Platform based topics: standard of HLO service; rig identification; helideck lighting; ease of seeing the position of the helideck on the platform in daylight and at night; visual cues during the approach, hover and landing; the quality of flood lighting on helidecks; visual interference from other lights on the platforms; turbulence around the platforms.

(9) Miscellaneous topics and general workload issues: commercial pressures; standardisation; rosters and flight time limitations (FTLs); other problems with the work schedule; aspects of the job that impact on workload; the main factors that contribute to workload; and the main safety concerns with North Sea and Irish Sea Operations.

2.0.3 In some of these Sections respondents were asked to provide ratings (on a 10-point rating scale) on the contribution of the various factors to workload and safety hazards. In all such questions respondents were given the opportunity to expand on their responses with comments. Indeed, most questions in the questionnaire invited respondents to make comments.

2.0.4 As can be seen from the detailed contents of the questionnaire above, the survey addressed the majority of aircrew workload issues. Since the first aim of this survey was to investigate workload associated with in-flight paperwork the first part of the Results Section of this report will concentrate on data from questions in which paperwork was the primary subject of concern, i.e. mainly questions in Section 7 of the questionnaire. That said, other (secondary) factors which may impinge on the workload associated with paperwork, e.g. aircraft lighting, standardisation of rules and procedures, commercial pressures, and standard of HLO service, are discussed in the second part of the results section. Data analysis of all questions in the questionnaire are included, along with a copy of the questionnaire, in the Annexes to this report.

2.0.5 Since the second aim of the survey was to interpret the effects of workload associated with in-flight paperwork in the context of overall aircrew workload, the third part of the results section of this report concentrates on the ratings given to workload levels and potential safety hazards of all factors associated with helicopter operations. Special attention has been given to the comments made in the final two questions in the questionnaire which questioned respondents about the main factors that contribute to workload and asked them to identify what they believed to be the main safety concerns with North Sea and Irish Sea helicopter operations.

2.0.6 To conclude the results section, a summary of findings from the interview stage of the study is included in part four.

3 ANALYSIS

3.0.1 Many questions required the respondent to circle a number on a rating scale. For these questions, frequency distributions of the scores were drawn, and the means and standard deviations of the scores were calculated. As there was a large enough sample size to enable comparative statistics to be carried out, an analysis of variance (followed by a series of post hoc comparisons) was carried out comparing the workload ratings for each question with the background factors, such as aircraft type (see Annex 2). These tests gave an indication of how the background factors influenced the responses to the questions. It should be noted that the post hoc comparisons applied more stringent tests, and hence some of the differences apparent from the analysis of variance were not proven. A further analysis of variance was then carried out across the questions concerning safety hazards.

3.0.2 Comments for each question were grouped to enable the main themes relating to workload and safety hazards to emerge. Some questions required text answers. The points raised in the text were categorised according to subject areas, and frequency counts were carried out on each category.

3.0.3 As mentioned earlier, the text of this report mainly details analysis of those questions relating to in-flight paperwork, and discusses limited analysis of some other questions. The reader, therefore, is referred to the Annexes for more comprehensive detail. Annex 1 gives a summary of the answers to each of the questions and provides an overview of the questionnaire, and Annexes 2 and 3 provide further background data.

4 RESULTS: PART I – WORKLOAD AND SAFETY ISSUES OF IN-FLIGHT PAPERWORK

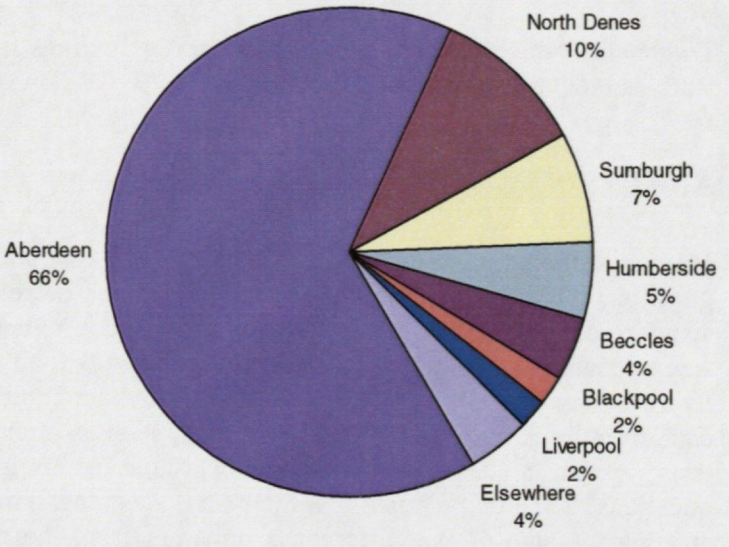
4.1 Response rate

4.1 1 380 questionnaires were distributed to UK-based helicopter pilots and 281 completed questionnaires were returned, this represents a response rate of 74%. A small number of questionnaires (n=4) were received after the scaled (quantitative) questions had been analysed, so they have not been included in the analysis. However, **all** responses have been included in the listing and categorising of comments.

4.2 Background information

4.2.1 Respondents from 16 different bases returned completed questionnaires. The majority of respondents (66%) were based in Aberdeen, 10% were based in North Denes, and 7% were based in Sumburgh. Figure 1 summarises the operating bases of respondents.

Figure 1: Whole sample – Operating Base

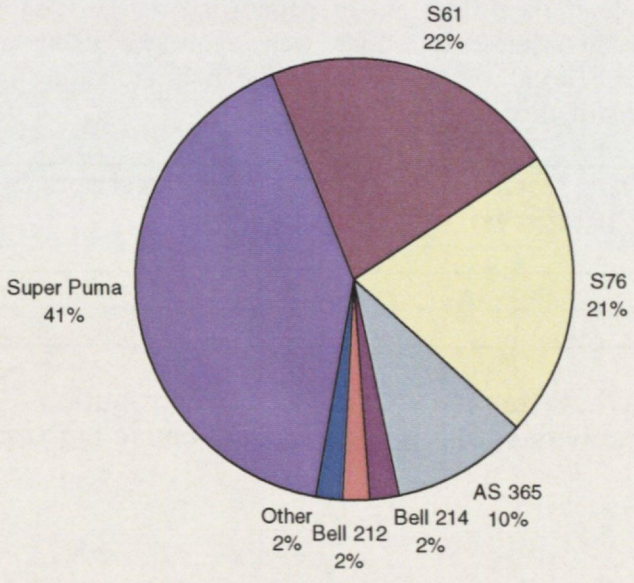


4.2.2 Three quarters of the respondents were Captains and the remaining quarter were First Officers. Just under a half of respondents (42%) worked for Company B, and approximately a quarter each worked for Company C (27%) and Company A (23%). Only one respondent worked for Company D. In terms of North Sea or Irish Sea operational flying experience, more than three quarters of respondents (78%) had over five years experience and 61% had between 2,000 and 7,000 flying hours.

4.2.3 The majority of respondents (79%) flew between 300 and 700 operational hours per year. Just under two thirds of the respondents (65%) usually flew trips of two hours or more, and 70% of respondents typically made up to three landings per trip. Trips with between 8 and 20 landings were made typically by 14% of respondents.

4.2.4 The most widely used aircraft were Super Pumas, S61s and S76s. The aircraft type flown most frequently by respondents is summarised in Figure 2.

Figure 2: Whole sample – Aircraft Type



4.2.5 The majority of aircraft were fitted with some type of AFCS / autopilot and many were fitted with RNAV1 or 2 (49% and 37%, respectively). The vast majority of pilots (96%) flew (and answered the questions in the survey based on the viewpoint of) twin pilot operations. Very few respondents (4%) flew single pilot operations. Further details are given in Annex 2, Summary of Background Information.

4.2.6 Analysis of background information identified some differences between the groups of pilots operating on the Northern North Sea (NNS) and Southern North Sea (SNS).

4.2.7 As mentioned in Paragraph 2.0.4 the results section will focus firstly on questions that were directly related to in-flight paperwork, i.e. those in Section 7. After these have been considered, other questions which were secondary to paperwork but potentially could impinge on it will be considered.

4.2.8 Section 7 of the questionnaire was entitled the "During flight..." Section and comprised 15 questions (Q22-37). These questions can be considered under eight separate sub-headings:

- in-flight paperwork, contribution to workload (Q24, 31, & 33);
- calculating load and fuel in-flight (Q23);
- navigation log / flying log design (Q25 & 26);
- duplication of entries (Q27);
- late changes / timeliness of information (Q28-30 & 32);
- automation of in-flight paperwork (Q34);
- storage and handling of in-flight paperwork (Q35); and
- paperwork system improvements (Q36 & 37).

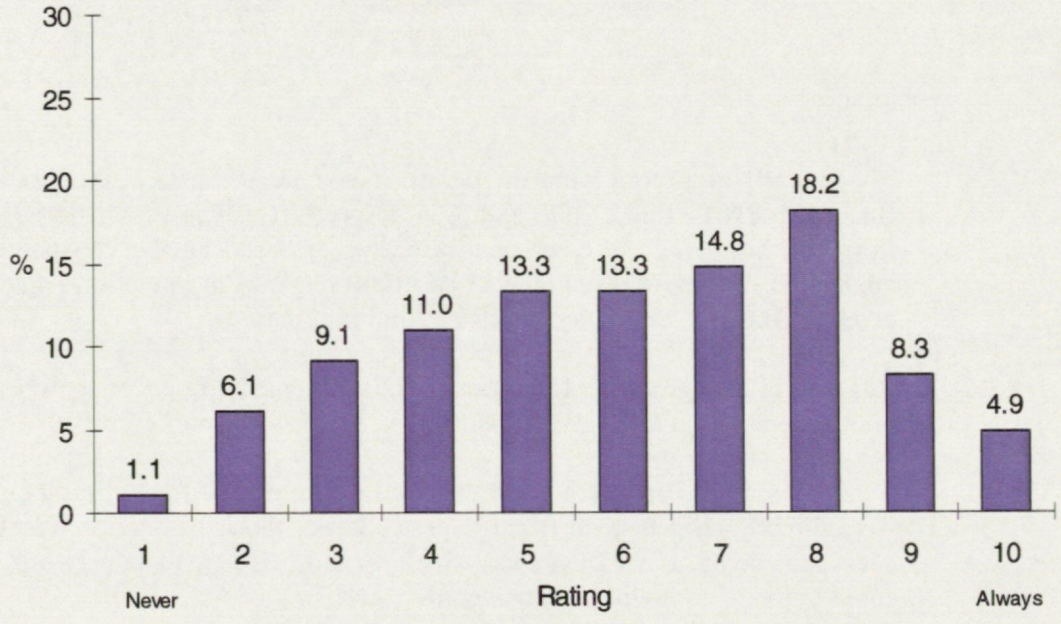
4.3 In-flight paperwork, contribution to workload (Q24, 31, 33)

4.3.1 Three questions in this section related to the general effects of in-flight paperwork on workload. Question 24 asked respondents if the filling out of paperwork caused high workload and if the filling out of paperwork caused a safety hazard during flight. Answers to both these questions were requested using a 10-point scale (where 1='never' and 10='always'). Table 1 summarises the ratings for workload and Figure 3 shows the distribution of these ratings.

Table 1. Q24i. Does the activity of filling in paperwork cause high workload? (1=never; 10=always)

n	Mean	Mode	% responding 8-10
265	6.0	8.0	31.4%

Figure 3: Whole sample – Q24i Ratings distribution.
Does the activity of filling in paperwork cause high workload?



4.3.2 As data in Table 1 and Figure 3 indicate, almost one third of respondents rated the activity of filling in paperwork as a very frequent cause of high workload (i.e. giving a rating of 8 or higher). Although the mean rating was 6 it was interesting to note that the mode (most frequently chosen) rating was 8.

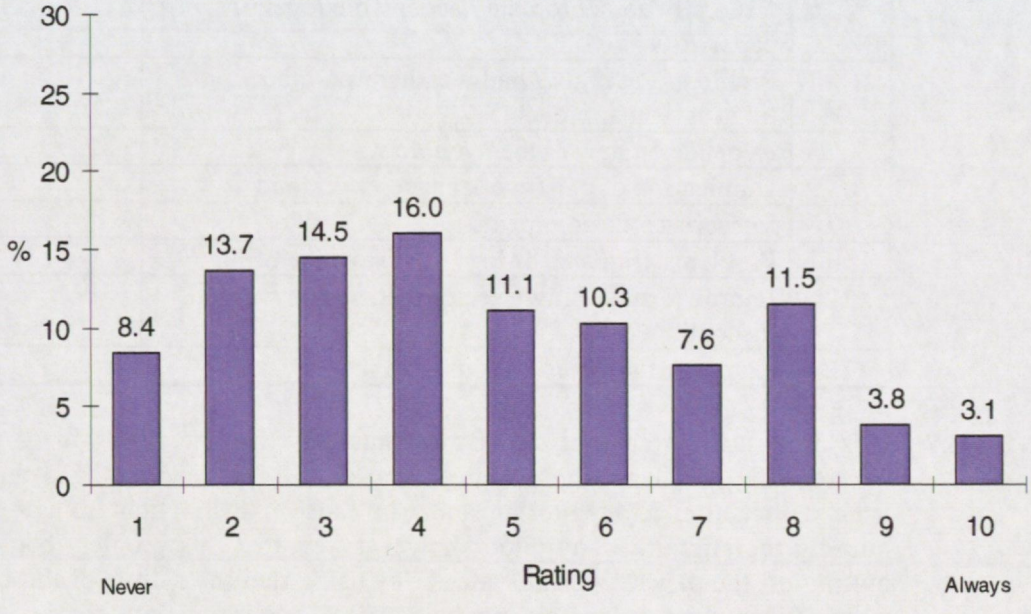
4.3.3 Further statistical analysis of responses to this question revealed significant differences with the rank of the respondent, the navigation fit of the aircraft, and the number of offshore landings made in a typical return trip. First Officers indicated that filling in paperwork caused high workload more frequently than Captains, respondents making larger numbers of off-shore landings per return trip were more likely to report frequent high workload, and those flying with GNS navigation systems were also more likely to report frequent high workload compared to those with DECCA.

4.3.4 Respondents were asked whether the filling out of paperwork caused a safety hazard. Table 2 and Figure 4 summarise these ratings data.

Table 2. Q24ii. Does the activity of filling in paperwork cause a safety hazard? (1=never; 10=always)

n	Mean	Mode	% responding 8-10
262	4.7	4.0	18.4%

Figure 4: Whole sample – Q24ii Ratings distribution.
Does the activity of filling in paperwork cause a safety hazard?



4.3.5 Filling in paperwork caused a safety hazard less frequently than it caused high workload and few respondents (18.4%) felt that paperwork caused a very frequent safety hazard. Statistical analysis revealed significant differences with the type of operation being flown and the total flying experience of respondents. Those flying mainly shorthaul trips (Southern operations) indicated that filling in paperwork caused a safety hazard more frequently than those flying long haul trips, and those with 6000 or more total flying hours were also likely to report filling in paperwork as a more frequent safety hazard than those with less than 3000 hours.

4.3.6 Respondents were offered the opportunity to make comments about the filling in of paperwork and 56% (n=160) took this opportunity. Since this question was of such direct relevance to the main aims of the survey a thorough coding analysis was conducted on the comments. Table 3 summarises the frequency of each category of comment.

General Note (throughout the results section): Some respondents' comments covered a range of issues and were, therefore, coded into more than one subject area category. As a result the total number of comments summarised in these Tables may be greater than the number of respondents.

Table 3. Comments relating to the filling in of paperwork and its effect on workload and safety

Rank	Subject area / category	Frequency	Percentage (n=160)
1	Problem when flying shuttles / short hops / multi-landings	35	22
2	Loss / breakdown of monitoring / distraction / reduction of two pilot operation to single pilot operation	33	21
3	If it becomes a problem do it later / don't let it become a problem	31	19
4	Increases workload / too much (routine / unnecessary) paperwork	18	11
5	Problems if changes, e.g. to route or load	16	10
6	Generally not a problem / acceptable level of paperwork	14	9
7	Problem if at night / bad weather / poor cockpit lighting / on approach	12	7
8	Depends on how / when you do it	10	6
9	Duplication of paperwork causes workload	8	5
10	Miscellaneous comments	7	4
11	Problems with size of log / safe stowage of log	3	2
12=	Improved since single sector load sheets were discontinued	2	1
12=	Comes with the job / get used to it	2	1

4.3.7 It is quite clear from analysis of the comments that the filling in of paperwork causes considerable problems when having to make multiple landings, and that problems result from a reduction in monitoring and can cause a distraction from the primary task of piloting the aircraft. Many pilots, however, felt that this problem could be managed by putting off the paperwork until later or by using their own 'rule of thumb' when deciding when to do the paperwork, e.g. not below 500', or within 10nm of rig.

4.3.8 To give a flavour of the comments being made a few have been given below:

"In this case [poor weather] occasionally paperwork entries are missed out and filled in later, or even back at base! Surely this negates the whole idea of in-flight paperwork / Flight log."

"...the pilot controls the workload by leaving shuttle sheets etc., until on the deck if required. Often, the information is presented at 'the wrong time' by the platforms. It is a question of taking control of the timing."

"Last minute changes of load / passenger details cause significant increases in workload, especially on multi destination flights. This is much worse / more

dangerous when combined with poor weather and instrument approaches. It calls for disciplined prioritising to prevent dangerous situations."

"The completion of paperwork, whilst en route, persistently degrades safe operation of the aircraft (mandatory 2 crew). Paper chasing along the route always impinges on the approach phase and is a constant trap ready to spring on the unwary – checks get completed without proper cross reference etc., etc."
"During shuttling flights we do not have a non-handling pilot, we carry a secretary doing complex sums of actual passenger weights, working out C of Gs on a computer, and entering sector data in the IHUMS!! Plus sundry other duties at the request of the various customers. We do not have one set of procedures – they can vary from customer to customer – it is no surprise to me that there have been nasty deck incidents."

4.3.9 The second question that requested information concerning the effects of in-flight paperwork on workload was Q31. This question comprised four parts which asked respondents to rate the frequency with which in-flight paperwork increased workload either slightly, moderately, or caused high or very high workload. Data from this question are summarised in Table 4.

Table 4. (Q31) The frequency with which in-flight paperwork causes....

Frequency	...slight increase in workload %	...moderate increase in workload %	...high increase in workload / interferes with task %	...very high increase in workload / becomes a safety hazard %
never	1	1	7	39
rarely	10	13	38	41
sometimes	34	54	40	16
frequently	37	27	12	3
always	18	4	3	1

4.3.10 From Table 4 it is clear that in-flight paperwork is most likely to cause moderate increases in workload 'sometimes' and cause slight increases in workload 'frequently' or 'sometimes'. Although paperwork sometimes causes high workload, such that it interferes with other tasks, it only rarely causes situations where it is deemed to be a safety hazard.

4.3.11 Statistical analysis of responses to each of these questions indicated no significant differences in all but the fourth question (very high workload / safety hazard). Responses to this question indicated that those flying short-haul (Southern operations) felt that in-flight paperwork caused very high workload / safety hazard more frequently than those flying long-haul (Northern operations).

4.3.12 Respondents were offered the opportunity to comment and 35% (n=99) took this opportunity. Analysis of the comments revealed that 68% of these respondents (n=68) commented that when paperwork became a hazard or caused high workload they would leave it and do it later or prioritise the work more efficiently.

4.3.13 Again, to give some indication of the types of comment being made, a representative selection follows:

"Most paperwork is completely unnecessary for the safe operation of the flight."

"Using IHUMS and RNAV as they should be used helps to alleviate the problem – but if you then have to re-write the paperwork for the "CAA Requirement"?"

"There certainly is enough paperwork to become a problem if you let it. It's down to experience / practice and CRM. Fly the A/C first – the paperwork can almost always wait."

"The combination of recording IHUMS sector data digitally, and Nav. log sector data does cause people to have their heads down too often. Also unnecessary observations and weather reports are logged for destinations visited only 30 minutes previously."

"I have had to physically remove paperwork from my co-pilot on finals."

"My motto is – if in doubt leave the paperwork, not doing it will not kill you, but doing it on short finals in min. vis. will."

4.3.14 The final question in this section (Q33) was totally comments-based and asked respondents whether in-flight paperwork affected any other aspects of the trip. Just under half the respondents (46%, n=132) made comments. Table 5 summarises these comments.

Table 5. Comments relating to the affect of in-flight paperwork on other aspects of the trip (Q33)

Rank	Subject area / category	Frequenc	Percentage (n=133)
1	Breakdown of monitoring / CRM / look-out in-flight	35	26
2	No / no effect	32	24
3	Problems with stowage / design / uses of Nav. log/board	15	11
4	Miscellaneous comments	13	10
5=	Problems with clutter / time to find paperwork	8	6
5=	Frustration	8	6
5=	Breakdown of monitoring / look-out on deck	8	6
8=	Longer stops / delayed departures	6	4
8=	Keeps you busy / alert / gives you something to do	6	4

4.3.15 A few comments are provided below to give an indication of the points being made:

"It gives one something to do on the trip back when you have to re-write it all so that it can be understood."

"Affects C of G when Nav. board is moved!!"

"Not in-flight, but on deck. When one pilot is out on the deck checking loading, fuel, etc., the pilot at the controls of the running A/C is always tempted to carry out some 'head down paperwork' to expedite the turnaround. This is dangerous."

"Lookout for military A/C is lost for a few minutes – plenty of time for collisions."

"Where to put the Navigation board, no provision in design of cockpit except side pockets and difficult to see out of them."

"Having the clipboard lying around in the cockpit can be a safety hazard. Likewise, the failure of the clip and subsequent bomb-burst of the various sheets of paper. If the non-flying pilot is writing on the board resting on his knee, the cyclic control is restricted for the handling pilot."

"In an increasingly automated environment it [paperwork] has the effect of 'focusing' the crew at regular periods."

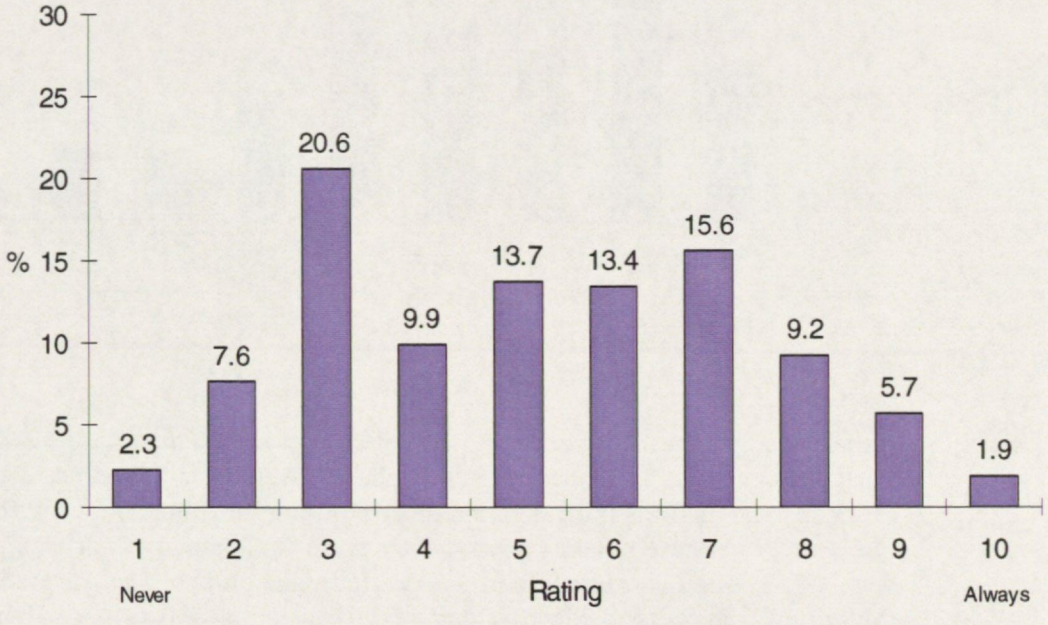
4.4 Calculating load and fuel in-flight (Q23)

4.4.1 One question directly addressed the issue of the activity of calculating load or fuel requirements and its effect on workload and safety (Q23). Respondents were asked to rate the frequency with which it caused either high workload or a safety hazard. Answers to both these questions were requested using a 10-point scale (where 1='never' and 10='always'). Table 6 and Figure 5 summarise the ratings for workload.

Table 6. Q23i. Does the activity of calculating load or fuel requirements during flight cause high workload? (1=never; 10=always)

n	Mean	Mode	% responding 8-10
262	5.2	3.0	16.8

Figure 5: Whole sample – Q23i Ratings distribution. Does the activity of calculating load or fuel requirements during flight cause high workload?



4.4.2 From Table 6 and Figure 5 it can be seen that load and fuel calculations cause high workload fairly frequently. However, only 16.8% indicated that this activity caused high workload very frequently (i.e. a rating of 8 or higher) and the most frequently chosen rating was 3.

4.4.3 Statistical analysis identified two significant differences between various sub-groups in the sample. Pilots flying for Company A felt that calculating load or fuel requirements caused high workload much more frequently than pilots flying for Company C or

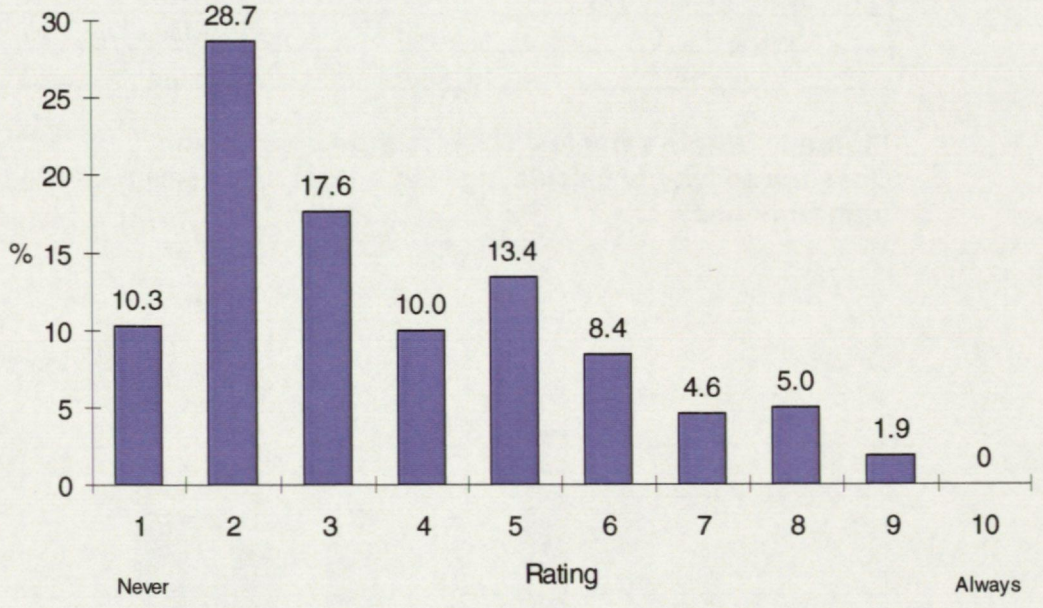
Company B (means were 6.6, 4.8, and 4.8, respectively). Also pilots flying long haul (Northern operations) felt that workload was increased more frequently by these activities than those flying short haul (Southern operations).

4.4.4 In the second part of Q23 respondents were asked whether the activity of calculating load or fuel requirements caused a safety hazard. Table 7 and Figure 6 summarise these ratings.

Table 7. Q23ii. Does the activity of calculating load or fuel requirements during flight cause a safety hazard? (1=never; 10=always)

n	Mean	Mode	% responding 8-10
261	3.7	2.0	6.9

Figure 6: Whole sample – Q23ii Ratings distribution. Does the activity of calculating load or fuel requirements during flight cause a safety hazard?



4.4.5 Ratings data suggest that calculating load or fuel requirements caused a safety hazard fairly infrequently. The most frequently chosen rating was 2, and no respondents chose 10. Statistical analysis indicated that those working for Company A felt this activity was more likely to cause a safety hazard than those in Company C or Company B (means were 4.7, 3.3, and 3.4, respectively). This finding is probably not surprising considering this group's answers to the first part of this question. Also, those flying single pilot operations felt that this activity caused a safety hazard more frequently than those flying two pilot operations (means were 5.7 and 3.6, respectively).

4.4.6 Respondents were offered the opportunity to comment in this area and 40% (n=115) took advantage of this. Table 8 summarises the main categories of comment.

Table 8. Comments relating to the calculation of load and fuel (Q23)			
Rank	Subject area / category	Frequenc y	Percentage (n=115)
1	Problems with late changes to load, route etc.	26	23
2	Problems if in poor weather and / or night and / or at certain phases of flight	24	21
3	Problems if shuttling / short / multi- sectors	20	17
4	Don't let it become a problem / do it later if safety is affected	14	12
5	Problems with monitoring / situational awareness	12	10
6	Not a problem	11	9
7=	Commercial problems – juggling max. payloads and min. fuel	9	8
7=	High workload / too much / poor paperwork	9	8
9	Miscellaneous comments	7	6
10	RNAV 2 fuel calculation helps	5	4

4.4.7 To aid appreciation of the nature of the comments being made, a few are given as examples below:

"The planning for return / onward legs tends to take place in the last half hour before landing at destination, this results quite often in one pilot being out of the loop when both should be concentrating on the descent / approach, especially in bad weather."

"This is one of the major tasks; to offer the highest payload that can be safely carried, to carry sufficient fuel and reserves, and not to run out of fuel!!"

"Always a problem on helicopters due to constant demand for maximum payload. In my view the most stressful component of flying on the North Sea. (Oh, to be flying 737s – uptake 9 tonnes, burn off 3 tonnes – what a wonderful reserve!)"

"Crew occasionally disagree on fuel requirements!"

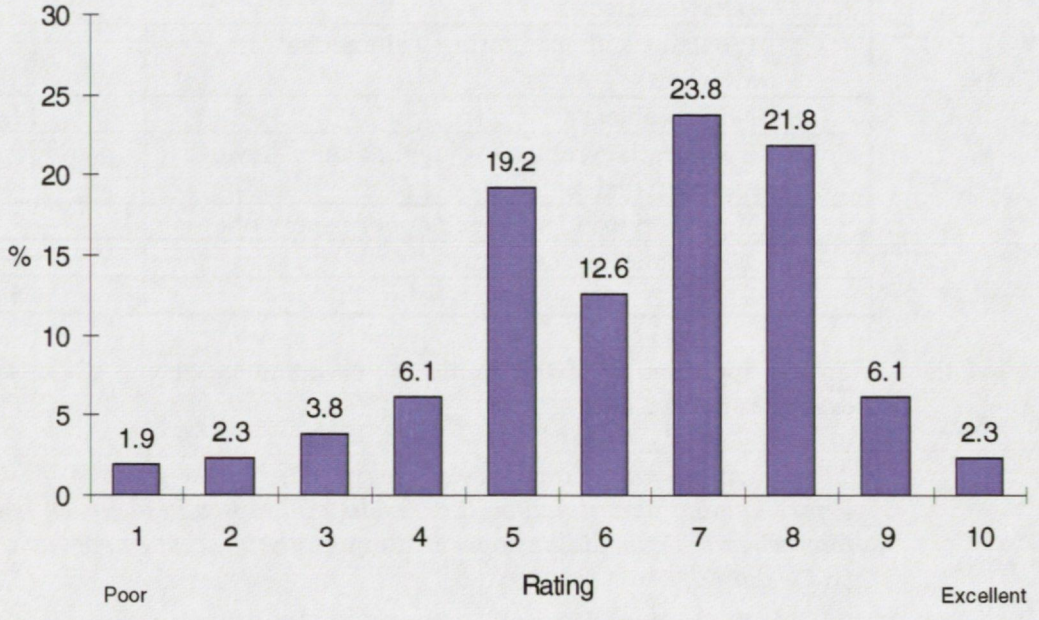
"Workload is fine provided that the information required is readily available. Some clients offer payloads in lbs / kgs and expect crews to convert at 10m finals."

4.5 Navigation log / Flight log Design (Q25 & 26)

4.5.1 Two questions asked respondents about the design of the Nav. log (Q25) and the ease with which it could be understood (Q26). For the first question respondents were asked to rate the design on a ten point scale (where 1=poor, and 10=excellent). Table 9 and Figure 7 summarise these ratings.

Table 9. Q25. The in-flight Nav. log / Flt log design is.....? (1=poor; 10=excellent)			
n	Mean	Mode	% responding 8-10
261	6.3	7.0	30.2

Figure 7: Whole sample – Q25 Ratings distribution
The in-flight Nav. log / Flt log design is.....?



4.5.2 From the data presented in Table 9 and Figure 7 it can be seen that the design of the in-flight log was rated as being good, with just under a third of respondents rating it as very good / excellent (i.e. a rating of 8 or higher). Statistical analysis of these data revealed no differences between the various sub-groups in the sample.

4.5.3 After the ratings part of Q25 respondents were able to submit written comments. Just over a quarter of respondents (28%; n=79) did this. Just over a third of respondents who commented (34%) stated that their Nav. log was OK or adequate. Other comments related to the Nav. log being too complex or involved with too many boxes, that there were duplications of entries, or that it needed to be better tailored to their type of operation. Some comments are given as examples, below:

"It's not the design that's bad – just the ridiculous number of boxes we have to fill in – it is supposed to be a flying aid, not a chore."

"Nav. log is reasonable but the Technical log requires far too much duplicated information."

"In my opinion, a 'clipboard' type / size Nav. log is not suitable for single pilot Ops. At our base we use a specifically designed kneepad log, on which we can record everything deemed necessary."

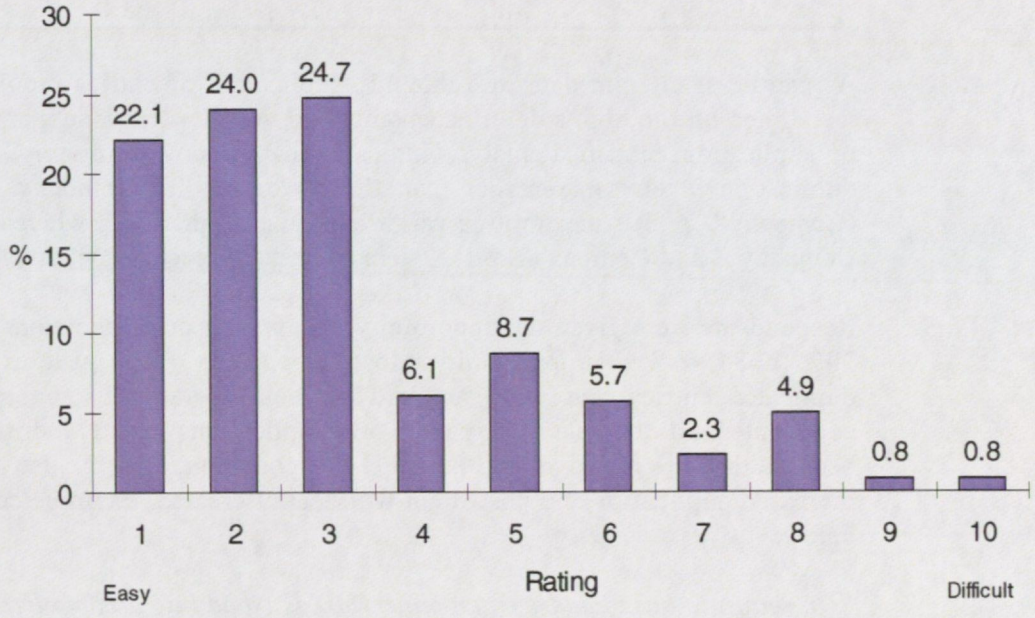
"Boxes for information too small to write legibly in a helicopter."

4.5.4 Question 26 requested respondents to rate how easy or difficult they found it to understand the Nav. log / Flt log. Ratings, again, were based on a ten point scale (where 1=easy, and 10=difficult). Ratings are summarised in Table 10 and Figure 8.

Table 10. Q26. Is the in-flight Nav. log / Flt log easy or difficult to understand? (1=easy; 10=difficult)

n	Mean	Mode	% responding 8-10
263	3.2	3	6.5

Figure 8: Whole sample – Q26 Ratings distribution
Is the in-flight Nav. log / Flt log easy or difficult to understand?



4.5.5 As can be seen from the data in Table 10, the Nav. log was generally regarded as easy to understand, most respondents (70%) gave ratings of 3 or below. Statistical analysis indicated that pilots working for Company A rated the Nav. log as more difficult to understand compared to those working for Company C or Company B (means were 4.1, 2.8, and 2.9, respectively).

4.5.6 Again, respondents were given the opportunity to comment. 13% of respondents (n=37) made comments. The comment most frequently made (by 43% of these respondents) was that the Nav. log was complex / difficult to understand until you were familiar with it. Other comments were that constant changes cause confusion and that the paperwork was too involved and unnecessary. Some comments are provided below as examples:

"Easy to understand, difficult to use."

"Work towards removing paperwork from our cockpit oven – better remove paperwork completely – the equipment and software are all readily available."

"Although it is difficult for new boys to understand, the fact is that it is difficult to see how to design an easy one which complies with all the requirements."

4.6 Duplication of entries (Q27)

4.6.1 One question directly addressed the area of duplication of entries in paperwork (Q27). Respondents were asked to assess how much duplication of entries was required by their paperwork. Five response options were offered, these were: none; low; acceptable; high; and unacceptably high. A summary of responses to this question is shown in Table 11.

Table 11. Q27. In your opinion, how much duplication of entries is required by your paperwork? (n=264)

none %	low %	acceptable %	high %	unacceptably high %
1.9	14.0	37.9	31.8	14.4

4.6.2 As can be seen from data in Table 11, duplication of entries required by paperwork were rated on the high side of acceptable and very few respondents felt that there was no duplication. Statistical analysis indicated that pilots working for Company C felt that duplication levels were higher than those working for Company A or Company B (Company C pilot's mean rating was around the 'high' level, whereas those ratings for Company A and Company B pilots were around the 'acceptable' level).

4.6.3 Respondents were given the opportunity to comment on duplications in paperwork and 29% (n=84) took this opportunity. Most respondents (30%) gave explicit examples of duplicated entries that were required in their operation, some respondents (17%) commented on the fact that paperwork duplications could and should be reduced because they are too high, and others (14%) commented on the use of IHUMS and the increased duplication and post-flight workload it created. Example comments are given below:

"On return to base hand-written paperwork is typed into a computer which prints the same thing only on different coloured paper."

"After flight – high [duplication] – same material goes into HUMS, tech log, Flt planning. One entry only required – then fed to all other computers – would be the answer."

"A refuel can require the fuel uplift to be recorded on new log, SSLS / MSLS, tech log, IHUMS, often more than once and in different units on the same piece of paper."

"Firstly you make a hand written copy in the cockpit. Secondly with the advent of IHUMS all the sectors have to be put in post flight, 20 sectors or more is common. Thirdly the customer wants a legible copy as well."

"It would be better if crews were required to enter what is necessary for the safe conduct of the flight rather than what the CAA required in order that they may 'reconstruct' the flight at a later date."

"This is the single greatest source of frustration and high workload at a time when the crew should be preparing for the approach and landing. The client has been aware of our ETA for between 2-4 hours, surely he can finalise his load in the correct units by ETA minus 30 minutes."

4.7 Late changes / Timeliness of information (Q28, 29, 30, 32)

4.7.1 Four questions addressed problems associated with late changes in load or route and the effect this had on paperwork and workload. Question 28 asked respondents how frequently changes in loads or routes necessitated changes to be made to completed paperwork. Table 12 summarises these responses.

Table 12. Q28. During flight, to what extent do late changes in load, or to your planned route, necessitate changes to paperwork that has already been completed? (n=267)

never %	rarely %	sometimes %	frequently %	always %
0.4	10.1	46.1	38.6	4.9

4.7.2 Data in Table 12 indicate that the majority of respondents felt that late changes necessitated changes to completed paperwork 'sometimes' or 'frequently'. Statistical analysis indicated that the number of off-shore landings made by respondents in a 'typical' trip affected their responses, such that the more landings made the more frequently paperwork was affected (the mean rating of those making 1-2 landings was around 'sometimes', whereas the mean for those making 5 or more landings was around 'frequently', with those making 3-4- landings falling between the two).

4.7.3 Comments to the issues raised in Q28 were made by 29% (n=84) of respondents. Table 13 summarises the main categories of comment.

Table 13. Comments relating to late changes in load or route (Q28)

Rank	Subject area / category	Frequen	Percentage (n=84)
1	Late changes cause problems – frustration, annoyance, confusion	15	18
2=	Part of the job / resigned to late changes	13	15
2=	Depends on the customer / some good some bad	13	15
4	Late changes not a problem	10	12
5=	Don't plan ahead / leave paperwork until things are finalised	9	11
5=	Changes can be very late / very involved	9	11

4.7.4 Some example comments are given below:

"We did have a system of no route changes before take-off which worked well. This seems to have slipped and changes as we walk out are not uncommon."

"Normally wait before I've spoken to all destinations in a group before completing paperwork – this makes for more of a rush, but on the other hand avoids changes."

"Our routes are never set in tablets of stone."

"Clients consider it a right to alter, re-schedule, change, ad nauseam. Reports are submitted but to no avail."

"Last minute changes or routing by client can cause aggravation and hassle. Some pilots actually get angry!"

"The increase of multi-sector flights, e.g. 9 sectors, in recent times, has led to an unacceptable level of paperwork, exacerbated by the fact that one often receives fax loads at the last moment, and changes after paperwork has been completed."

"In this base route / payload frequently not known until 10 minutes before take-off, i.e. when in aircraft. Commercial pressure / contract renewal pressure means no change likely."

....[late changes happen] "Most often with X and Y (and Z when we used to have those contracts) Z is universally the most unpopular client to fly for."

4.7.5 The second question in the section on late changes (Q29) asked respondents whether the timeliness with which they received information required to complete paperwork caused high workload or a safety hazard. Answers to both these questions were requested using a 10-point scale (where 1='never' and 10='always'). Table 14 and Figure 9 summarise the ratings for workload.

Table 14. Q29i. Does the timeliness with which you receive the information required to complete paperwork, cause high workload? (1=never; 10=always)

n	Mean	Mode	% responding 8-10
262	5.8	8	28.2

Figure 9: Whole sample – Q29i Ratings distribution. Does the timeliness with which you receive the information required to complete paperwork, cause high workload?

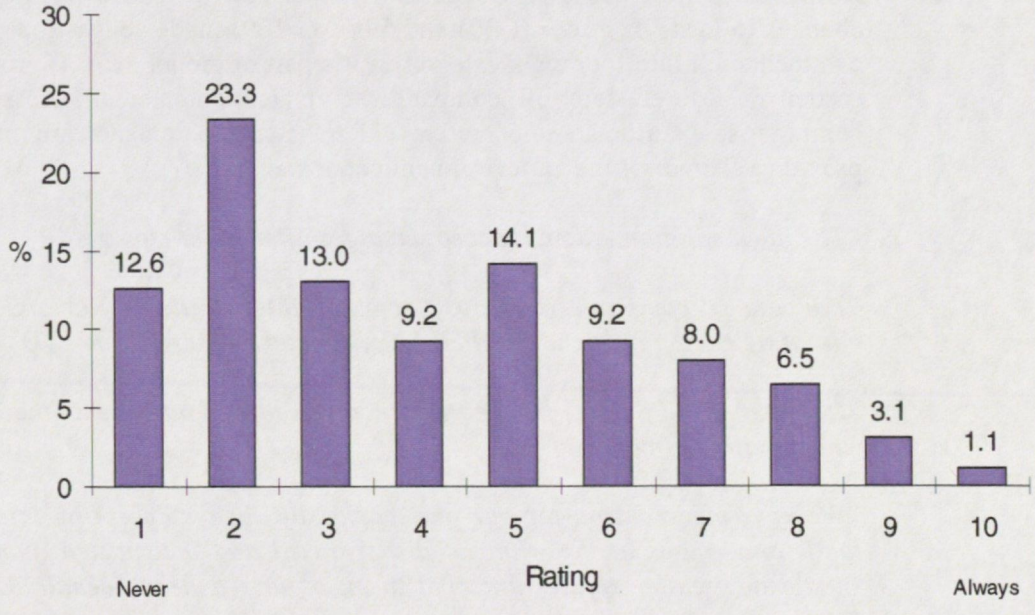
4.7.6 As data in Table 14 and Figure 9 indicate most respondents felt that late information frequently caused high workload. Response ratings peaked around 7 and 8 and over a quarter of respondents felt that late information was a very frequent cause of high workload (i.e. ratings of 8 or higher). Statistical analysis indicated that helicopter operating company and number of off-shore landings affected responses to this question. Pilots working for Company C felt that high workload was caused more frequently than those working for Company A or Company B (means were 6.7, 5.9, and 5.3, respectively). Increasing numbers of landings resulted in higher ratings, i.e. 1-2 landings = 5.4; 3-4 landings = 5.9; and 5+ landings = 7.0.

4.7.7 In the second part of Q29 respondents were asked whether the timeliness with which they received information required to complete paperwork caused a safety hazard. Table 15 and Figure 10 summarise these ratings.

Table 15. Q29ii. Does the timeliness with which you receive the information required to complete paperwork, cause a safety hazard? (1=never; 10=always)

n	Mean	Mode	% responding 8-10
262	4.1	2	10.7

Figure 10: Whole sample – Q29ii Ratings distribution. Does the timeliness with which you receive the information required to complete paperwork, cause a safety hazard?



4.7.8 As can be seen above, few pilots felt that this aspect of paperwork caused a safety hazard. Statistical analysis revealed that single pilots were more likely to experience a safety hazard as a result of late information than those flying two pilot operations (rating means were 7.1 and 4.0, respectively).

4.7.9 Again, respondents were given the opportunity to comment in this area. 36% (n=104) made comments. The majority of those making comments (29%) commented that they would leave the paperwork until later / do it on deck, rather than risk safety. Other main

comments were that the timeliness of information could cause problems / distractions, and that it could cause high workload. Some sample comments are given below:

"Offshore locations often seem unprepared to receive helicopter. Seldom offer return load at time of first contact (usually 20 mins before arrival) sometimes have to be chivvied to provide weather data. Often very short finals before deck clearance received from HLO."

"The later the info. the greater the hazard, but I don't write and fly at the same time!"

"When information is late or changes with only a few miles to run workload increases considerably. If we left it all 'til on deck, the oil company wonders why we are so long on deck."

"Can contribute to safety hazard if the planned destination is unrestricted and the new one is, as calculations have to be carried out airborne as opposed to sorting it all out on deck.."

"Helicopter = Flexible."

"It is par for the course. We expect last minute changes therefore it causes no surprises. Just look at the state of some of our Nav. logs to see the deletions and changes. I carry a Tippex pen in my flying suit."

4.7.10 Respondents were asked for suggestions about how to reduce workload caused by late changes to loads or routes (Q30) and 59% (n=169) made suggestions. The majority of comments fell into four main categories: It's part of the job (27%); provide routes / info. earlier (27%); educate oil companies / reduce commercial pressures (13%); and computerise / automate the system (11%). Some comments are included below to provide a flavour of the variety of comments made:

"The ideal solution – do not accept changes after flight closure."

"Educate oil companies to "close" their flights a little earlier and educate the operating company to change their late departure criteria from STD +1 minute."

"It's part of the job, we must fit the requirements of our clients the best we can, whilst maintaining safety."

"We have made a 'rod for our own backs' by always accepting late changes to loads and routes at the whim of disorganised and incompetent companies. We should now either refuse to accept them, or levy a heavy penalty on persistent 'offenders', the scale and frequency of these changes has to be seen to be believed."

"Digital broadcast of information into the IHUMS sector details page, all you have to do is acknowledge on the radio. The potential for satellite data transmissions between rigs and aircraft can't be far away for the passing of weather and load details."

"The oil companies are our customers. So the customers need to appreciate our problems (most do), but some don't have a clue."

"Get the offshore fields to have an intelligent logistics co-ordinator with authority. It appears in the SNS that every Tom, Dick, and Harry has a say on routings."

"It would be a good idea to train radio ops (rigs) and rig heli-admin to the methods of flight planning, and therefore they would understand and predict poor payloads."

4.7.11 The final question in this section (Q32) asked respondents if they thought that workload would be improved if late changes to the in-flight paperwork were eliminated. Responses were given on a 10 point scale (where 1=not at all, and 10=all workload problems would vanish). Table 16 and Figure 11 summarise these findings.

Table 16. Q32. How much do you think your workload would be improved if late changes to the in-flight paperwork were eliminated? (1=not at all; 10=all workload problems would vanish)

n	Mean	Mode	% responding 8-10
258	6.1	8	39.1

Figure 11: Whole sample – Q32 Ratings distribution. How much do you think your workload would be improved if late changes to the in-flight paperwork were eliminated?

4.7.12 From the data presented above it is clear than many respondents felt that the removal of late changes would reduce workload considerably. Statistical analysis indicated no significant differences in sub-groups in the sample.

4.7.13 Comments were made on Q32 by around a quarter of respondents (24%; n=68). The main areas for comment were: the elimination of late changes would be impossible / impracticable (25%); a reduction would be welcome (20%); changes are minimal / not a problem (15%); and need to maintain flexibility / meet client demands (15%). A few comments are listed below:

"If all late changes were eliminated then a much more relaxed attitude would prevail on the flight-deck, with greater capacity to 'think ahead of the aircraft' and keep in touch with the crew."

"...And they all lived happily ever after!"

"Paperwork is a pain and a complete distraction for one member of the crew. This is more of an organisational problem and generally extends running time on deck rather than being a hazard in flight."

"It would make life easier but it is not why we are here. Our job is to carry out a task for a client and to try and achieve their programme. If their requirements change at short notice then that is part of the business."

4.8 Automation of in-flight paperwork (Q34)

4.8.1 One question directly addressed the use of automation as a way to reduce in-flight paperwork (Q34). Respondents were asked to suggest aspects of in-flight paperwork that could be replaced by automation. 64% of respondents (n=183) made at least one suggestion. The most frequently suggested aspects of paperwork to be automated were: load / shuttle sheets (36%); take-off / landing times / details (15%); flight plans / Nav. log (13%); fuel loads (8%); and manifests (8%). Another 8% of those who made comments claimed not to like or trust automation. Because most respondents simply listed the types of paperwork to automate no comments have been quoted here as examples.

4.9 Storage and handling of in-flight paperwork (Q35)

4.9.1 Question 35 was divided into three parts and addressed difficulties caused by the storage and physical handling of paperwork, other problems with paperwork, and suggestions to reduce these problems. The first part asked if the storage and handling of paperwork in the cockpit caused any difficulties and was answered by 86% of respondents (n=245). Although many respondents (25%) answered the question with a "no" response, most other comments could be categorised into four main subject areas: storage problems / lack of stowage space (32%); too much paper / volume of paperwork to be handled (15%); problems with clipboard stowage (10%); and general lack of space / problems of accessibility; and manipulation of paperwork in the space available (7%). Some of these comments are listed below as examples:

"Cockpit was never designed to handle often 20 manifests, and frequently more."

"The size and amount of paperwork normally means carrying an A4 clipboard which is awkward and can interfere with the controls."

"There are limited storage facilities. Most paperwork seems to end up on the floor between pilots."

"Nowhere to store Nav. log. Nowhere to display approach plates."

"Bulldog clips sometimes not big enough for all the manifests. Sometime 20 to 30 sheets for a 3 minute sector."

"The separation of paperwork on a multi stop trip means that it is 'stowed' in different places around the cockpit to keep the paperwork for each stop separate."

4.9.2 The second part of Q35 asked whether there were other general problems with paperwork that caused difficulties. This question was answered by 54% of respondents (n=154). Although 29% of respondents gave a "no" response to this question, the same proportion claimed that the volume of paperwork was too great. Other comments were categorised into three main subject area categories: poor format of manifest sheets (22%); lack of standardisation of forms (10%); and concerns over the interference of paperwork in flight planning and execution (8%).

4.9.3 The final part of Q35 asked respondents to suggest how paperwork-related difficulties could be reduced. This question was answered by 42% of respondents (n=119) and the responses were categorised into four main subject areas: standardise forms (40%); reduce duplications (25%); make use / better use of automation / computers (18%); and provide more / better storage space in the cockpit (4%). Some suggestions are given below as examples:

"Standardise our working practises with all our customers."

"Automation and integration into a computerised system – go see KLM helis in Norwich."

"A radical review of the whole problem of the dangerous goods offshore! The requirement to sign for items on a tossing deck in a winter storm is nonsensical."

"Reduce the amount of paperwork and improve cockpit lighting."

"Each landing, receive one manifest giving details of everyone on board. Crew hands previous manifest in each time. This would mean a max. of one manifest all the time and save running through several sheets each landing to work out what should be on board."

4.10 Paperwork system improvements (Q36 & 37)

4.10.1 The final two questions of the "In-flight" section of the questionnaire asked respondents if they had experience of using other systems of paperwork that were better than their current system (Q36), and asked for general suggestions for how paperwork could be improved (Q37).

4.10.2 Just under a quarter of respondents (22%; n=63) had experience of other paperwork systems (Q36). Comparisons were made with systems operated by British Gas, British Airways, KLM, Brathens, military systems, systems used in Norway and Canada, and those used by other North Sea operators / customers, e.g. BP and Bristows. Many respondents referred to systems in which better use was made of electronic recording / computers (28%), better Nav. logs (with tick boxes etc.) (22%), and paper-less systems (10%). However, some respondents (24%) claimed that other systems they had experienced were no better than their current system. Some comments giving examples of 'better' systems are given below:

"Shuttle flights within the BP 40's field are assisted by ground based input into load / fuel calculations with details of next leg / routing being controlled by a BP employee. This is of great help especially if flying single pilot."

"British Gas's LOMS system provides summaries for intermediate legs."

"Weathermation systems used in Wisconsin provide everything you could ever hope for the flight planning."

"...[military] all paperwork is done pre-flight – in-flight paperwork is non-existent."

"Helicopter service in Norway. Pilots fill in ONE document in flight, one line for each sector. When they land this is taken away and loaded into the Net computer for Tech records, accounts, client billing, pilot log book, duty hours, the lot!"

"The Bristows MSLS computer system is simply great!"

"KLM Heli Holland. Planning and loading all done well in advance. One uses RNAV computers to make changes in the loading if necessary."

"British Gas generate the best manifests on the North Sea."

4.10.3 Question 37 asked for suggestions for ways in which paperwork could be improved and was answered by 28% of respondents (n=79). Most suggestions could be categorised into three main subject areas: use single sector sheets / more relevant boxes / less duplication (35%); eliminate paperwork / use RNAV (29%); and combine Tech log / Load sheets (19%). Six respondents commented that paperwork was not a problem. A few comments are given below as examples:

"Why do I have to fill up to 6 or 7 virtually identical columns in the MSLS to prove that my RTOW / RLW are greater than / equal to my actual weight."

"Make it the customer who has to keep statistics, not aircrew. Use the flight safety carrot to force the customer to automate paperwork (it worked with IHUMS!!)."

"Address the problem of multiple duplication – let's trust our new technology – HUMS, RNAV2 and get rid of everything except the most basic of paperwork which the knee pad could suffice for – or get rid of the new technology and adapt the cockpit for desk use by the non-handling pilot, who at present is just a clerk."

"Reduce the amount of information we carry around but never use.".

"I do feel strongly that handing a handful of poorly written manifests through the cockpit window to the crew in this computerised age is not far short of being disgraceful. It should not be beyond the capability of the client, in the cool calm of an office environment, to produce 1 x single manifest to cover each sector."

"Suggest to clients, our management, and the CAA that heaps of paper are not the product."

"To a certain level doing the paperwork is occupational therapy. It can alleviate the tedium of long sectors. To reverse this function entirely may well not be a good thing, it simply needs a concentrated effort on all sides to make what is done both necessary and sufficient."

5 RESULTS: PART II – SECONDARY ISSUES

5.0.1 A number of sections of the questionnaire addressed areas in which paperwork was not the subject of primary interest. As mentioned at the start of the report these data are included in the annexes but are not discussed separately in the report. However, certain areas were thought to have an impact on, or be relevant to, paperwork and were, therefore, considered to be of secondary importance and worthy of consideration in this report. These areas were cockpit lighting, standard of HLO service, commercial pressure, and standardisation. Data from these questions in the questionnaire are discussed selectively, especially where paperwork has been mentioned specifically in the comments. Full details of ratings etc., for the questions in the following sub-sections can be found in the annexes.

5.1 Cockpit Lighting (Q12b)

5.1.1 Question 12b addressed the influence of cockpit lighting on workload and safety issues. Comments on this question were given by 44% of respondents (n=126) and of those making comments on cockpit lighting ten respondents (8%) mentioned paperwork. All comments mentioned that cockpit lighting was inadequate for completing paperwork, especially at night. A few comments are given below as examples:

"There is no effective lighting to allow the left hand seat occupant to carry out the massive amount of paperwork required on shuttle operations. The use of a torch causes loss of vision for both pilots – when they need it most – on a black wet night."

"High workload due to very poor lighting to lap. Cockpit paperwork v. difficult – overhead wanderlight for each pilot needed."

"Poor cockpit lighting for non-handling pilot to do paperwork, or lights so bright handling pilot night vision destroyed. (Wanderlight with variable rheostat was useless 30 years ago and still is)."

"Instrument lighting is adequate but lighting to view Nav. log, paperwork, approach plates, etc., totally inadequate. Have to resort to using a personal torch."

5.2 Standard of HLO Service (Q38)

5.2.1 Question 38 asked respondents about how the standard of HLO service affected workload and safety. Although 54% of respondents (n=155) made comments, no one specifically mentioned paperwork in this regard. Earlier comments made in the in-flight section of the questionnaire did, however, suggest that poor HLO led to a greater requirement for monitoring by aircrew and that this was incompatible with the completion of paperwork, led to additional workload, and could affect safety on deck.

5.3 Commercial pressure and standardisation (Q48 & 49)

5.3.1 Question 48 asked respondents whether commercial pressure affected workload and safety. Comments were made by 36% of respondents (n=104). Although some felt that commercial pressure was a 'self-imposed' form of pressure and should be ignored many felt pressurised to 'give-in' to customer demands or risk management wrath or possible dismissal. Although no specific comments were made regarding paperwork, earlier comments suggested that the perceived requirement to meet almost all customer demands led to late changes being made which affected paperwork and workload and could affect safety.

5.3.2 Question 49 addressed standardisation issues between oil companies and their effects on workload. Although 34% of respondents (n=98) made comments no one mentioned paperwork specifically. Most comments related to differences in company procedures regarding lifejackets and safety briefings. However, this question (like all the others mentioned in this section – except Q12b) came after the in-flight section in which paperwork was addressed in detail and this is likely to have led respondents to mention 'other' issues here. Once again, from earlier comments it is clear that standardisation of paperwork is desirable and non-standardisation affects aircrew workload.

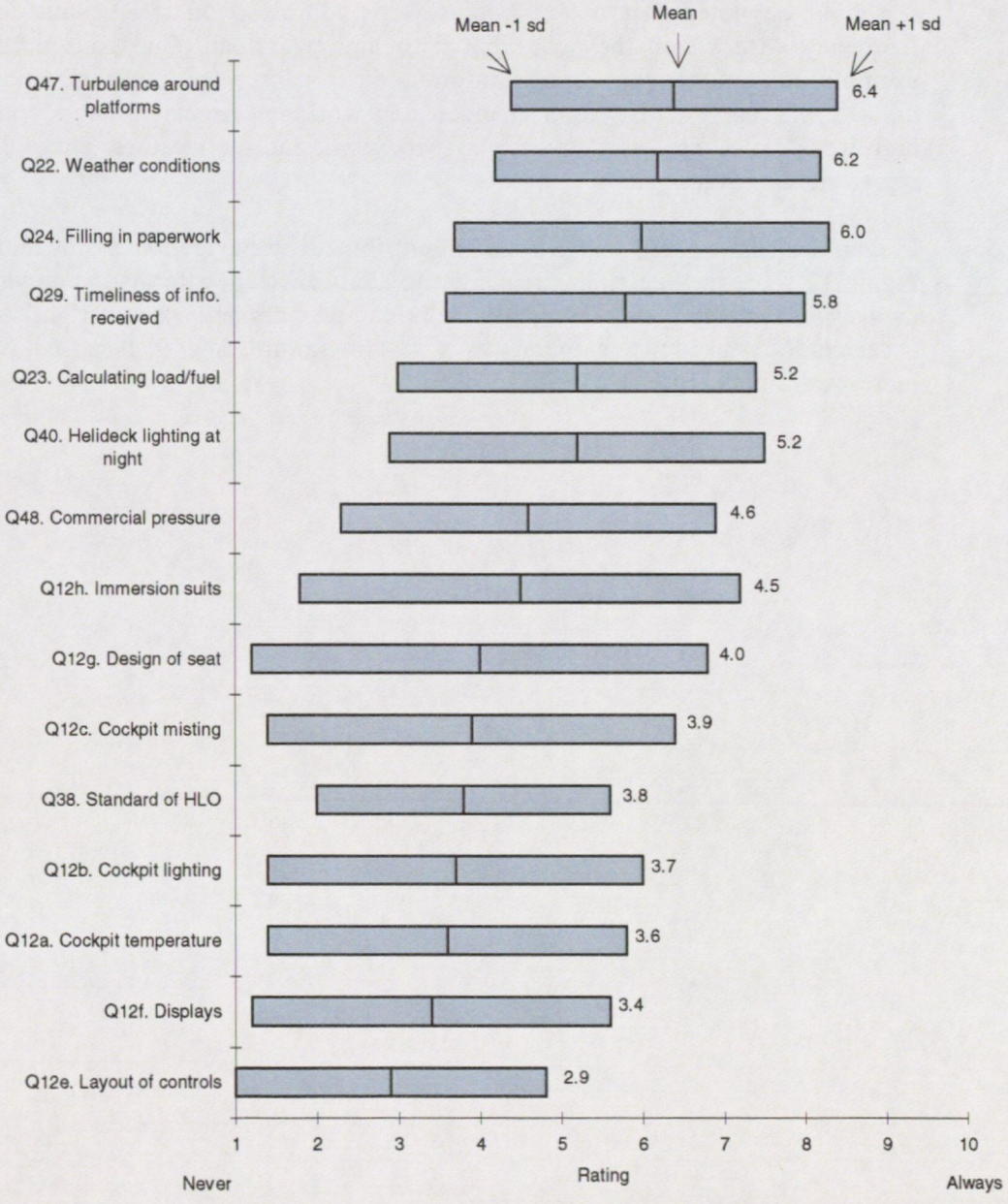
6 RESULTS: PART III – SUMMARY OF ALL ASPECTS AFFECTING WORKLOAD

6.0.1 To view the workload problems associated with paperwork in context this section summarises data provided by respondents on all other aspects that could affect workload. Many questions in the questionnaire asked respondents to rate the effect of individual factors on frequency of high workload and as a safety hazard. In addition, the last two questions in the questionnaire (Q52 & 53) asked respondents to prioritise aspects that affected workload with regard to their contribution to workload (Q52), and asked respondents to list those issues that they considered to be the major safety concerns to flying on the North and Irish Seas (Q53). This final results section considers responses to these questions.

6.1 Summary of 'frequency of contribution to workload' ratings

6.1.1 A number of questions asked respondents to rate how often a particular aspect of their operations contributed to high workload (a score of 1=never, 10=always). Figure 12 shows the mean scores for each aspect of workload, and represents the workload profile. Factors with high mean scores contributed to high workload more frequently than factors with low mean scores.

Figure 12: Whole sample – The frequency with which each factor contributed to workload



(Note for Figures 12 and 13: The horizontal bars indicate the mean rating ±1 standard deviation (sd). The mean is shown as the central vertical mark in each bar and its value is given to the right of the bar. The standard deviation value (indicated by the rest of the bar, and shown either side of the mean) represents the range of ratings given by the majority of respondents and gives an indication of the spread of the data.)

6.1.2 An analysis of variance was carried out on these ratings data to identify significant differences between factors in their frequency of contribution to workload. If the number of times two factors contribute to workload is shown to be so great that the probability of it happening by chance is less than 5%, then the difference between them is described as 'significant'

6.1.3 Statistical analysis indicated that turbulence, weather, and the completion of paperwork, were rated as contributing to high workload significantly more often than any other factors. Similarly, the timeliness with which information was received for paperwork completion contributed to high workload significantly more often than the factors appearing below it in Figure 12, such as calculating load and fuel, the helideck lighting at night, the effect of wearing the immersion suit, etc.

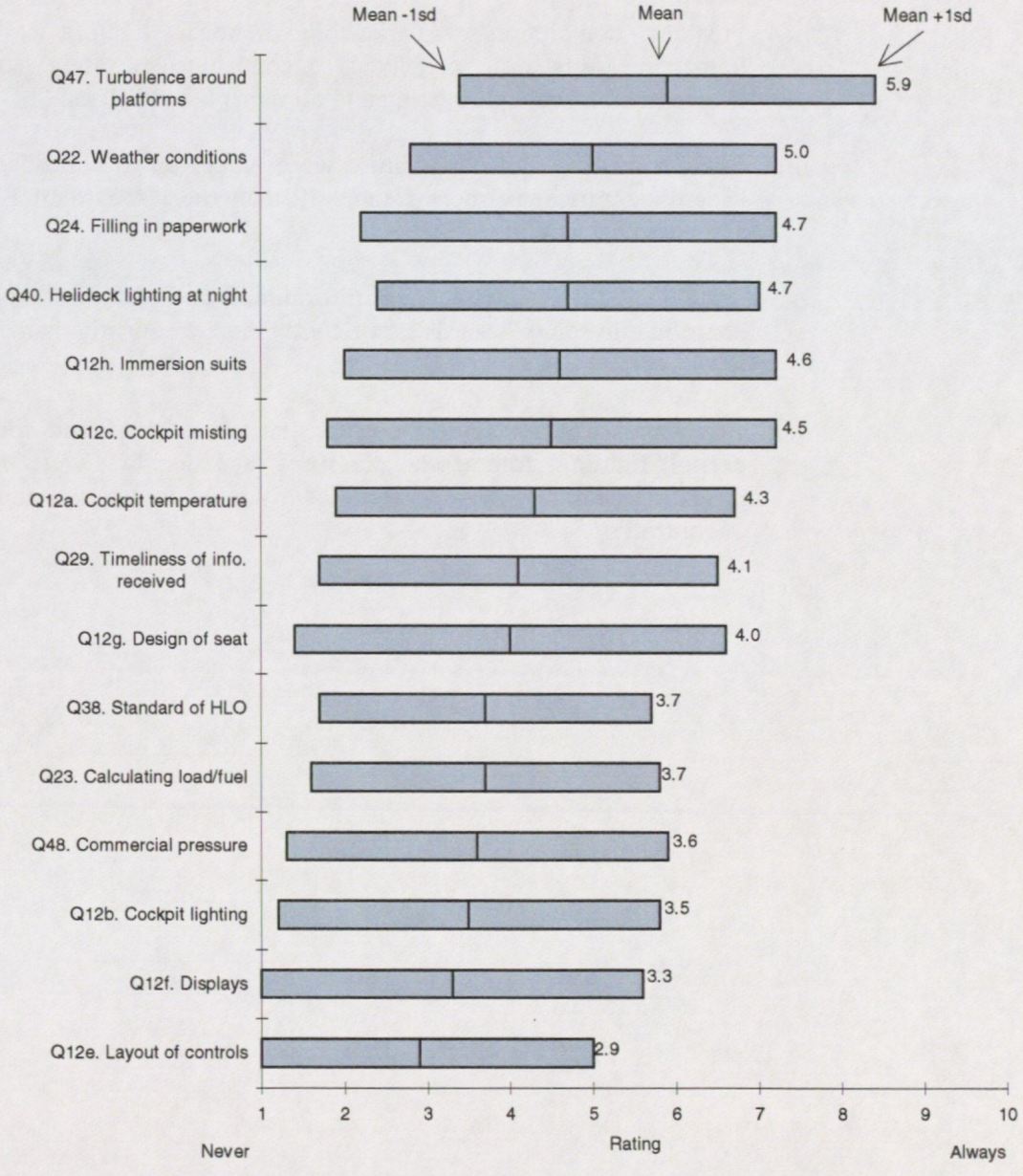
6.1.4 It should be noted that not all topics were addressed on a 10 point scale of the frequency with which they contributed to high workload. Questions on rosters, for example, invited free text replies. Information from free text questions and comments indicate that early starts, roster changes, and working unsociable hours contributed to high workload almost as frequently as paperwork and the weather. These data are not represented in Figure 12.

6.1.5 It should also be noted that workload contributed by navigation is not represented in Figure 12 since the questionnaire sought to elicit different information about the use of navigation systems. Area navigation workload was normally 'about right' or 'low'. It occasionally peaked when there was a system failure, and that caused workload to increase dramatically.

6.2 Summary of 'frequency of contribution to safety hazard' ratings

6.2.1 A number of questions asked respondents to rate how often a particular aspect of their operations contributed to safety hazards (a score of 1=never, 10=always). Figure 13 shows the mean score for each factor contributing to safety hazards. Factors with high mean scores were rated as contributing to a safety hazard more often than factors with low mean scores.

Figure 13: Whole sample – The frequency with which each factor contributed to a safety hazard.



(Note for Figures 12 and 13: The horizontal bars indicate the mean rating ±1 standard deviation (sd). The mean is shown as the central vertical mark in each bar and its value is given to the right of the bar. The standard deviation value (indicated by the rest of the bar, and shown either side of the mean) represents the range of ratings given by the majority of respondents and gives an indication of the spread of the data.)

6.2.2 As with the workload ratings, safety hazard ratings data were subjected to statistical analysis to identify significant differences between factors in their contribution to safety hazard. Turbulence in the area of the platforms was rated as contributing significantly more frequently to safety hazards than any other factor. The weather contributed significantly more frequently to safety hazards than cockpit misting and all the topics listed in Figure 13 below cockpit misting.

6.2.3 Statistical analysis indicated that there were a number of significant differences between groups of factors shown in Figure 13. These were as follows:

i. Turbulence around platforms was perceived to be a safety hazard more frequently than any other factor.

ii. Weather, completion of paperwork, helideck lighting at night, and immersion suits were perceived to contribute to safety hazards more frequently than cockpit misting and all items listed below.

iii. Cockpit misting and temperature were perceived to contribute to safety hazards significantly more frequently than the standard of HLO service and items listed below.

iv. Seat design and timeliness of information received, were perceived to contribute to safety hazards significantly more frequently than displays and layout of controls.

v. The standard of HLO service, calculations of load and fuel in-flight, cockpit lighting, commercial pressures, and displays, were perceived to contribute to safety hazards significantly more frequently than the layout of controls.

6.3 Prioritising aspects of operations that affect workload (Q52)

6.3.1 Respondents were asked to consider all the aspects of their job that impacted on workload and to prioritise up to five of these aspects in order of their importance (Q52). The three most frequently listed aspects as 'Priority 1' were: in-flight / duplication of paperwork (19%); weather / met. procedures (19%); and rostering (12%). Considering all responses to Q52, in-flight / duplication of paperwork was cited by 71% of respondents (n=201); more than any other aspect. Table 17 summarises these data.

Table 17. Q52 – No. of respondents citing each job aspect that contributes to workload – prioritised in order of importance with regard to its contribution to overall workload.

Aspect of job	Priority					Total No. of citings
	1	2	3	4	5	
In-flight paperwork / changes to paperwork / duplication of paperwork	55	50	51	30	15	201
Weather conditions / met. procedures / lack of accurate or timely met. information	54	31	24	17	8	134
Rostering / changes to rosters / early starts / long gaps	34	27	15	9	8	93
Standardisation of nav aids / ergonomics / comfort	31	22	16	14	8	91
Aircraft handling / lack of autopilots or heading hold systems / fuel calculations / enroute re-fuelling / fuel vs. payload problems / poor aircraft performance	13	13	11	9	8	54
Pre-/ in- flight planning / alternates / diversions	10	9	5	7	3	34
Safety / survival / sea states / immersion suits	9	6	4	9	7	35
Flight time limitations	7	0	0	2	2	11
Management, including dissatisfaction with own company's management	6	3	9	6	9	33
Localised nav and radio problems / poor reception / interference / lack of 24hr cover	6	20	8	9	7	50
Employment security	6	4	1	3	3	17
Helidecks / lack of standardisation of helideck layout / poor lighting / turbulence / identification	5	21	23	9	7	65
Commercial pressures / pressure to get airborne on time	5	5	6	9	14	39
Training / workload associated with being a Training Captain / crew compatibility issues	4	4	8	2	3	21
Air traffic environment / inadequate ATC and radar coverage	4	11	4	2	6	27
Procedures / non-standard helideck procedures / lack of standardisation of customer safety requirements	3	4	0	0	0	7

6.3.2 As can be seen above, many of the job aspects listed in Table 17 overlap with areas identified in ratings questions presented in Figures 12 and 13. Although this is to be expected (as the interview stage of this study enabled most sources of workload to be addressed in the questionnaire), the ordering of these factors is not identical for three main reasons. First, Q52 was a free response question in which respondents could mention any aspect of their work, including areas not covered specifically by the questionnaire or included in the ratings questions (e.g. rostering, training). Second, data presented in Table 17 are ordered by the numbers of respondents rating each job aspect as 'Priority 1', rather than an overall frequency count (given in the right hand column), and third, comments coding analysis has been conducted to summarise the data. The latter was undertaken, for both Q52 and Q53, independently by three 'assessors' and the overall comments coding frame was created from these independent analyses.

6.4 Major safety concerns associated with helicopter operations (Q53)

6.4.1 The final question in the survey asked respondents to list the major safety concerns associated with North Sea or Irish Sea helicopter operations. Most respondents (89%; n=254) took the opportunity to make comments. The 14 main subject areas for comment are summarised in Table 18.

Table 18. Comments relating to major safety concerns (Q53)

Ran	Main Category	Also includes:	No	% (n=254)
1	Dissatisfaction with the air traffic environment: en-route and at the vicinity of installations	possible conflicts during letdown to the rig; frequency congestion and radio 'chatter'; vertical separation; lack of confidence in the probability of separation; radar coverage; military aircraft; class G airspace	72	28
2	Airworthiness integrity, dangers from flying in poor weather / sea states, and probability of unsurvivable ditching	weather minima and policy; policy on wearing immersion suits; safety procedures for aircrew and passengers	70	27
3	Cockpit workload (including administrative workload) and need for systems to ease aircrew tasks	paperwork; late changes to route or loads; policy on 'freezing' flights 30 mins before take-off; radio 'chatter'; suggestions for better Nav. systems or better auto flight capability; non-standardisation of equipment / cockpits	48	19
4	Flight time limitations (particularly the JAA scheme) and fatigue issues	early starts; rostering / duty hours; fatigue caused by immersion suits	44	17
5	Offshore installations: their marking, lighting, deck and radio operator competence, physical characteristics, and unmanned installations	all issues associated with helidecks, manned or unmanned, and the helideck staff / personnel; also turbulence in the vicinity of helideck	37	15
6	Commercial pressures imposed by oil companies or employers	financial pressures / constraints, and oil companies failing to understand the problems associated with piloting and helicopters	35	14
7	Morale, job security, company attitudes		21	8
8	Training and CRM issues	simulators, engine failure training, experience	20	8
9=	Flight deck environmental control / ergonomics	immersion suits	19	7
9=	Poor met. reporting and forecasting	incorrect / out of date weather reports, weather readings taken by helideck staff	19	7
11	Helicopter performance capability		18	7
12	CAA under-regulation	CAA not learned from history, failure to set standards	16	6
13	Icing clearances		11	4
14	CAA over-regulation	paperwork requirements (also in 3)	6	2

(Note: Some respondents' comments covered a range of issues and were, therefore, coded into more than one subject area category. As a result the total number of comments summarised in this Table is greater than the number of respondents.)

7 RESULTS: PART IV – DATA FROM INTERVIEWS

7.1 Summary of situations in which paperwork contributed to high workload or safety hazards

7.1.1 In interviews with aircrew, paperwork, helideck lighting at night, the weather, and immersion suits were said to contribute similarly frequently to safety hazards. During the interviews aircrew said that they did not think of paperwork as being their greatest problem. They said that some data had to be entered more than once, but this was seen more as an irritant than a safety hazard. Helicopter operating companies had either designed their own forms to suit their needs, or, as in the case of Company C, they had reviewed their paperwork in the recent past and appeared to have the situation 'in hand'. However, paperwork did present difficulties in circumstances such as when the client oil companies provided late information concerning payloads, or late changes to payloads, or routes, then changes had to be made to existing plans, and paperwork had to be revised at short notice. This was done either during flight, or on the helideck. The problem of late changes to paperwork was worst in operational situations where the trips typically involved 5 or more stops. If late changes were to be eliminated, respondents estimated that improvements to workload would be substantial.

7.1.2 Workload was felt to be increased unnecessarily when the information on loads was given in a non-standard or an unsuitable format, (for example, in kilos instead of lbs), or if the information was incomplete (for example if the number of female passengers was not given).

7.1.3 The quality of radio transmission from the platforms to the aircraft was described as variable, and when it was poor, it increased the administrative workload of the aircrew. This was because the information on loads was transmitted by radio to the aircraft, and if anything interfered with the transmission, then the aircrew could not receive the information on their expected loads in good time.

7.1.4 The standard of HLO service ranged from excellent to poor. If the HLO service was regarded as poor, then when the aircraft was on deck, aircrew needed to spend their time supervising the refuelling, and watching to ensure that people did not walk into the rotor blades. In two crew operations, when one pilot is out of the aircraft, the other is required to stay at the controls, whilst rotors are running. In this situation it is dangerous if the pilot in the aircraft attempts to complete paperwork as it would compromise these and other safety tasks, such as monitoring the activities on deck. This situation, and the need to keep to schedule whilst also accommodating late changes, leads to pilots feeling pressured to complete paperwork whilst airborne rather than on deck.

7.1.5 At night, the poor quality of flight deck non-instrument lighting made the completion of paperwork difficult. There were too few wander-lights in the cockpit, and the lighting sometimes caused a hand shadow on the paper when aircrew attempted to complete paperwork.

7.2 Summary of suggestions for improvements from interviews

7.2.1 During interviews, aircrew suggested that information on loads should be given to them in good time to enable them to complete their calculations. Late changes to loads should be minimised, preferably eliminated.

7.2.2 Aircrew suggested that for the northern long haul trips in bad weather, they should be given information about their return load before they left their base. This would enable them to calculate their fuel requirements.

7.2.3 Aircrew requested that the level of service provided by HLOs should be more reliable and of a consistently good standard and they suggested reverting to the system where HLOs were trained by the helicopter operating companies, not the oil companies. It was also suggested that the helicopter operating companies should give the installation operator the information format that suited their needs, and that the load information should be provided in that format. Aircrew would not then have to re-configure the information for their own paperwork.

7.2.4 There were requests for a standard minimum quality of radio performance for transmissions from the rigs to the aircraft.

7.2.5 It was suggested that a person, based offshore, should be nominated to co-ordinate the load information for multi-sector flights. This person would be responsible for contacting the other rigs on the route and obtaining their load information. He / she would ensure this information was in the correct format for the aircrew, then pass it to the aircrew, telling them how many passengers and luggage, or equipment and relevant weights to pick up and drop at each stop.

7.2.6 During the interviews, aircrew discussed replacing the paperwork system with computers. They had mixed feelings about this and emphasised the fact that any computer system used to replace the paper system should be created specifically for its purpose and not be adapted from something else. Also it should be easy to use, with each item input once only.

8 DISCUSSION

8.0.1 The aim of this study was to establish whether, and under what circumstances, the workload imposed by in-flight paperwork was excessive and to interpret these data within the context of overall workload associated with North Sea and Irish Sea helicopter operations. This aim was achieved through in-depth interviews with 30 aircrew operating from Aberdeen and North Denes and through a comprehensive questionnaire survey distributed to all aircrew who were holders of CAA licences and employed in UK-based offshore operations.

8.0.2 The response rate for the questionnaire survey was 74%, which is considered to be excellent, and suggests a great deal of interest from aircrew in the issues raised in the questionnaire. Due to the large return rate it is unsurprising that respondents covered all UK-based offshore geographical areas, all major helicopter operating companies, all main aircraft types, and exhibited a wide range of flying and operational experience.

8.0.3 Data collected as part of this study came from three main sources: interviews; questionnaire ratings / response categories; and free response comments. Each source of information has its own strengths and weaknesses and these should be considered when interpreting data from the study. These sources of information will be considered, briefly, below:

i. Questionnaire ratings data (i.e. 10-point ratings, mostly 'never (1)' to 'always (10)') and response category data (i.e. constrained response options, e.g. 'never', 'rarely', 'sometimes', 'frequently', 'always') were supplied by the majority of respondents and, therefore, this form of data is probably the most reliable in terms of being the most complete form of data collected. For this reason, information gained from these data should be considered the most representative of the population as a whole. However, this source of data is also the most constrained and generalised type of information collected.

ii. Comments data were provided, typically, by 30-50% of respondents, and as a consequence the views expressed may be considered slightly less 'representative' of the population as a whole. It should be noted, however, that since the response rate was so high and the sample sent questionnaires was probably around 90% of the target population that this type of data is more representative than might normally be expected in a survey of this kind. Comments information is richer and more detailed than ratings / response category data, but may also be more subject to bias. Also free response data has a tendency to be more negative, since human nature dictates that individuals are more motivated to complain about what is not right, rather than mention what is good or satisfactory. In this context the questionnaire was quite well balanced in that it was designed to elicit both positive and negative comments by posing focused and structured free response questions and also by trying to elicit suggestions for improvements or experiences of 'better' systems. It must be noted, however, that these latter types of comment will be limited by respondents' knowledge and experiences.

iii. Interview data is, obviously, the most detailed and explicit since the interviewer can pursue subject areas in detail and follow-up ambiguous statements. Interview data, however, is likely to be the least representative, since it is gathered from the fewest people, and is also subject to the same biases as mentioned above for comments data, with the added disadvantage of the respondent's 'own words' not being available for re-inspection at a later point (unless video or audio tape is used).

8.0.4 Findings from this study are strengthened by the representativeness of the survey sample and by the range of data sources available. When drawing conclusions, the differences in data sources outlined above should be considered since inconsistencies can occur. When trying to resolve an inconsistency in the data it is important to consider both the 'representativeness' of the data and its likely depth and detail.

8.0.5 Interview data were used, primarily, to gain a full understanding of the problems facing aircrew employed in offshore helicopter operations, and these data were used as the starting point for the questionnaire design. Although the information elicited was detailed and specific it was taken from only 30 aircrew. In interviews paperwork was regarded as a source of irritation but not necessarily a safety hazard. However, paperwork did become a problem if there were late changes or if multiple landings were being made. Other factors, such as HLO service, poor radio transmissions, and poor cockpit lighting also had a knock-on effect on aircrew workload with regard to paperwork completion.

8.0.6 Given the individual nature of interview data, it is not surprising that very specific problems were raised during the interview stage. Although some of these problems were not addressed specifically in the questionnaire, many were identified in comments sections in the questionnaire, e.g. the pressure to complete paperwork and make a swift turnaround and the effect of this on monitoring / look-out whilst on deck.

8.0.7 The largest part of the results section of the report (Part I) summarised data in a number of paperwork-related areas. These data were reported in eight sub-sections, each of which will be considered in turn. Data in these sub-sections was mostly comments data but also included ratings data, and data taken from response categories.

8.0.8 Respondents were asked about the contribution to workload of in-flight paperwork (Q24, 31, & 33). Ratings data (Q24) indicated that almost a third of respondents felt that the completion of paperwork was a very frequent cause of high workload. First Officers and those respondents flying southern operations were likely to hold this view most strongly. Similarly, those flying southern operations were also more likely to feel that the completion of paperwork was a more frequent cause of safety hazard. Completion of paperwork most frequently caused a 'moderate' increase in workload (Q31) and those flying southern operations, again, reported greatest workload problems. Comments data (Q24) indicated that the completion of paperwork was most problematic when doing shuttling / multi-landings or if it was considered in combination with late changes or poor weather conditions. Many respondents commented that paperwork did not present a safety hazard because, if required, it could be put down and completed later. Other things that were affected by the completion of paperwork (Q34) were monitoring (in-flight and on deck), CRM, and problems of storage and clutter.

8.0.9 When the calculation of load and fuel in-flight was considered (Q23) it appeared to cause high workload more frequently for those flying northern operations, and caused a safety hazard more frequently for single pilot operations. Comments data indicated that problems occurred in the calculation of load and fuel in-flight if there were late changes, or if respondents were flying at night or in poor weather or on approach to deck. Monitoring was also affected and problems could be encountered when shuttling.

8.0.10 Respondents were asked about the design and ease of use of the Nav. / Flight log (Q25 & 26). Around a third of respondents felt that the design was very good, although comments indicated problems with the large number of boxes that needed to be filled in and the requirement to duplicate entries. Most respondents rated the Nav. log easy to understand, although, comments indicated that familiarity greatly aided understanding and frequent changes caused confusion.

8.0.11 Duplication of entries in paperwork was investigated in one question on the questionnaire (Q27). Respondents rated the duplication of entries on the high side of acceptable and some differences were noted between the responses of those working for the major helicopter operating companies. Comments data indicated a requirement to reduce duplications and mentioned the use of IHUMS and its effect in increasing post-flight workload.

8.0.12 Four questions asked about late changes and timeliness of information received (Q28-30 & 32). Late changes to load or route mostly necessitated changes to completed paperwork 'sometimes' or 'frequently' (Q28). The necessity to change completed paperwork increased with increasing numbers of offshore landings. Comments indicated that these changes to paperwork caused frustration and annoyance in aircrew although it was also viewed as 'part of the job'. Late information caused high workload very frequently (Q29). Again, this increased with the number of offshore landings being made, and some differences between helicopter operating companies were noted. Although the timeliness of information rarely posed a safety hazard, it was more of a problem for single pilot operations. Comments indicated that many pilots would leave paperwork completion to a later time and would constrain their planning to avoid the problems caused by late information. Suggestions to reduce the workload associated

with late changes (Q30) included: being given information earlier; educating customers to the problems late changes cause; reducing commercial pressures; and computerising / automating the system better. Ratings data indicated that the elimination of late changes would have a large effect on reducing workload (Q32) although comments indicated that, although a reduction of late changes would be welcomed, their elimination would be an impossible task since flexibility was an important aspect of offshore helicopter operations.

8.0.13 Respondents were asked to suggest aspects of in-flight paperwork that could be replaced by automation (Q34). Around two thirds of respondents made suggestions, the most frequently suggested was load / shuttle sheets, although most types of paperwork were proposed.

8.0.14 The storage and handling of paperwork was considered a problem by the majority of respondents (Q35). The main problems were a lack of storage space in the cockpit, the large amount of paperwork that needed to be handled, problems with clipboard stowage, and problems with accessibility and manipulation of paperwork in a confined space. General problems of paperwork were that there was too much, that manifest sheets were poorly designed, and that there was a lack of standardisation. The latter was especially problematic for respondents dealing with more than one customer. Comments relating to how problems could be reduced included standardisation of forms, reduction of duplications, better use of automation / computerisation, and better stowage facilities.

8.0.15 Experience of better paperwork systems and suggestions for system improvements were elicited in the survey (Q36 & 37). Less than a quarter of respondents had experience of alternative systems (Q36). Those that did compared their current systems to those used by British Gas, British Airways, KLM and other foreign operators, and military systems. Suggestions for system improvements (Q37) included: the use of single sector sheets; more relevant 'boxes' on paperwork; less duplication; increased use of RNAV; and combined Tech log./ load sheets.

8.0.16 Factors that impinged on the workload caused by in-flight paperwork, but were not of primary interest in this study, were: poor cockpit lighting; poor standard of HLOs; commercial pressure; and lack of standardisation. Many of these areas were addressed in comments from questions in the main sections on in-flight paperwork in the questionnaire.

8.0.17 Ratings data were summarised in Part III of the results section of this report. Respondents were asked to rate, for a list of factors, the frequency with which each caused high workload and the frequency of any associated safety hazard. The completion of paperwork was ranked high in this list, (third in order, below 'turbulence around platforms' and 'weather conditions') indicating that it was a frequent cause of high workload. Since only limited action can be taken to manage the top two factors, the paperwork system would appear to be an area in which workload-reducing action could usefully be targeted to the benefit of aircrew. Ratings on the frequency of safety hazard identified the same rank order for the top three factors (although 'helideck lighting at night' ranked equal third with completion of paperwork). This reinforces the potential value of action in this area. Although ratings data covered many areas pertinent to North Sea and Irish Sea helicopter operations, it should be noted that this list was not exhaustive. There was a suggestion from comments data that factors, such as rostering and early starts, contributed greatly to high workload.

8.0.18 When considering the workload imposed by in-flight paperwork in the context of overall workload, other data (Q52) indicated that paperwork, weather / met. procedures, and rostering were rated as the areas that impacted most on aircrew workload. Paperwork was the most frequently cited factor and was mentioned by more than 70% of all respondents.

8.0.19 When respondents were asked about the major safety concerns associated with their operations (Q53) comments were categorised and 'Workload' (a category which included many aspects of workload, e.g. the paperwork system, late changes, radio 'chatter') was third in the list of major safety concerns: below 'Dissatisfaction with the air traffic environment' and 'Airworthiness' (a category which included safety policy, survivability, sea states, weather minima, etc.).

9 CONCLUSIONS

9.0.1 On the whole, in-flight paperwork would appear to be a frequent cause of high workload and a major factor in offshore helicopter operations that contributes to workload. Although the completion of paperwork in-flight could occasionally cause a safety hazard, its impact on safety could usually be reduced by aircrew deferring its completion to a later or safer phase of the flight.

9.0.2 The likelihood of paperwork becoming a workload or safety problem increased on short-hop multi sector trips (more typical of Southern North Sea operations), especially if there were late changes to route or load. Those flying longer trips with fewer landings (more typical of Northern North Sea operations) were more likely to have their workload increased by the need to calculate load and fuel requirements in-flight, especially if there were late changes to routes or loads, or if weather conditions were poor. Paperwork is, predictably, more of a problem for single pilot, rather than dual crew, operations.

9.0.3 Among suggested improvements to the paperwork system, apart from ensuring that pilots did not attempt to complete paperwork on the approach to a rig or on the helideck, were to reduce the requirement to duplicate data entries, to redesign and standardise forms, to improve data entry using computerisation or automation, to educate those involved in helicopter operations to provide information to crews in an appropriate format and at an appropriate time in the flight, and to minimise the number of late changes to loads or routes.

– INTENTIONALLY BLANK –

Annex 1: North Sea and Irish Sea Helicopter Pilot Questionnaire

Summary of responses

SECTION 1

BACKGROUND INFORMATION

1 **Are you a Captain or a First Officer?**

CAPTAIN	75%
FIRST OFFICER	25%

2 **Which Company do you work for?**

COMPANY A	23%
COMPANY B	42%
COMPANY C	27%
COMPANY D	0.3%

OTHER (*please specify*) _____

3 **From where do you operate (e.g. Aberdeen, Beccles, etc.)?**

Operating Base	Percent Responses
Aberdeen	66%
North Denes	10%
Sumburgh	7%
Humberside	5%
Beccles	4%
Blackpool	2%
Liverpool	2%
Elsewhere	4%

4 **For how long have you been operating over the North Sea and/or the Irish Sea?**

LESS THAN 2 YEARS	3%
2 TO 5 YEARS	19%
MORE THAN 5 YEARS.	78%

5 **What are your total flying hours of North Sea and/or Irish Sea operations?**

Total Flying Hours	Percent Responses
0 – 1000	6%
1000 – 2000	5%
2000 – 3000	18%
3000 – 4000	15%
4000 – 5000	11%
5000 – 6000	10%
6000 – 7000	7%
7000 – 8000	6%
8000 – 9000	8%
9000 – 10 000	6%
10 000 – 11 000	7%
11 000 +	2%

6 **Approximately how many operational flying hours do you do each year?**

Operational Hours Per Year	Percent Responses
0 – 100	4%
100 – 200	1%
200 – 300	6%
300 – 400	11%
400 – 500	13%
500 – 600	33%
600 – 700	22%
700 – 800	8%
800 +	2%

7 **What is the total duration of the return trip that you fly most frequently?**

LESS THAN 1 HOUR	6%
1 TO 2 HOURS	28%
OVER 2 HOURS	65%

and typically, how many off-shore landings would this involve?

Number of Landings	Percent Responses
1	12%
2	38%
3	20%
4	6%
5	3%
6	3%
7	1%
8 – 20	14%

8 **Which type of aircraft do you fly MOST FREQUENTLY?**
(please circle only one type)

BELL 214	2%
BELL 212	2%
BOLKOW 105	0.3%
SUPER PUMA	41%
S61	22%
S76 A, A+, B, C	21%
AS.365N, N2, C	10%
AS 332	0.3%

9 **Which area navigation facility is fitted to this aircraft?**

NONE	0
RNAV 1	49%
RNAV 2	37%
DECCA MARK 19	3%
GNS	7%
TANS	7%
GPS	2%

10 **Does this aircraft have an AFCS/autopilot, or other flight stabilising system, coupled or uncoupled flight director system, or perhaps none of these?**

AFCS	52%
Autopilot	41%
Other	7%

End of Section 1

SECTION 2

THE REMAINDER OF THIS QUESTIONNAIRE ASKS ABOUT YOUR WORKLOAD

11 **Please indicate whether you are completing this questionnaire from the point of view of single pilot operations or two pilot operations.**

SINGLE PILOT OPERATIONS	4%
TWO PILOT OPERATIONS	96%

End of Section 2

Several of the questions ask you to indicate your answers by using a 10 point scale. The scales have a description at each end, such as 'never' or 'always'. Circle number 1 if the event never happens, circle a low number if it happens but not very often, a higher number if it happens more often, and circle 10 if it always happens.

SECTION 3

AIRCRAFT

12 **Do any of the following cause a high workload or a flight safety hazard?**

a **Cockpit temperature**

	Never									Always
High workload.....	1	2	3	4	5	6	7	8	9	10
Safety hazard	1	2	3	4	5	6	7	8	9	10

	Mean	Standard deviation
Workload	3.6	2.2
Safety hazard	4.3	2.4

Comments – 55% commented

b **Cockpit lighting**

	Never									Always
High workload.....	1	2	3	4	5	6	7	8	9	10
Safety hazard	1	2	3	4	5	6	7	8	9	10

	Mean	Standard deviation
Workload	3.7	2.3
Safety hazard	3.5	2.3

Comments – 44% commented

c **Cockpit misting**

	Never									Always
High workload.....	1	2	3	4	5	6	7	8	9	10
Safety hazard	1	2	3	4	5	6	7	8	9	10

Comments – 56% commented.

	Mean	Standard deviation
Workload	3.9	2.5
Safety hazard	4.5	2.7

d **Other difficulties with cockpit visibility**

Question 12 d – Other Difficulties With Cockpit Visibility

Difficulty	Count
Windows	4
Doors	11
Wipers	60
Visibility	30
Lights	4
Panel	4
Sun Glare	14
High Nose	6
Other	27

	Never									Always
High workload.....	1	2	3	4	5	6	7	8	9	10
Safety hazard	1	2	3	4	5	6	7	8	9	10

Comments – 52% commented

	Mean	Standard deviation
Workload	4.5	2.6
Safety hazard	4.9	2.9

e **Layout of controls**

	Never									Always
High workload.....	1	2	3	4	5	6	7	8	9	10
Safety hazard	1	2	3	4	5	6	7	8	9	10

Comments – 43% commented.

	Mean	Standard deviation
Workload	2.9	1.9
Safety hazard	2.9	2.1

f **Displays**

	Never									Always
High workload.....	1	2	3	4	5	6	7	8	9	10
Safety hazard	1	2	3	4	5	6	7	8	9	10

Comments – 49% commented.

	Mean	Standard deviation
Workload	3.4	2.2
Safety hazard	3.3	2.3

g **Design of seat**

	Never									Always
High workload.....	1	2	3	4	5	6	7	8	9	10
Safety hazard	1	2	3	4	5	6	7	8	9	10

Comments – 64% commented.

h **Immersion suits**

	Never									Always
High workload.....	1	2	3	4	5	6	7	8	9	10
Safety hazard	1	2	3	4	5	6	7	8	9	10

Comments – 71% commented

	Mean	Standard deviation
Workload	4.5	2.7
Safety hazard	4.6	2.6

i **Other personal equipment**

Question 12 i – Other Personal Equipment

Equipment	Count
Headsets	62
Life Jacket	42
Peltor	4
Intercom	3
Radio	2
Other	12

	Never									Always
High workload.....	1	2	3	4	5	6	7	8	9	10
Safety hazard	1	2	3	4	5	6	7	8	9	10

Comments – 47% commented.

	Mean	Standard deviation
Workload	3.1	2.3
Safety hazard	3.4	2.6

End of Section 3

SECTION 4

AIRCRAFT HANDLING

13 **Please use this question to indicate the extent to which aircraft handling ('stick and rudder control') affects your workload.**
(*Please circle the relevant word for each of the workload levels indicated below.*)

a. **Aircraft handling workload is LOW**

NEVER RARELY SOMETIMES FREQUENTLY ALWAYS

b. **Aircraft handling workload is ABOUT RIGHT**

NEVER RARELY SOMETIMES FREQUENTLY ALWAYS

c. **Aircraft handling workload is HIGH**

NEVER RARELY SOMETIMES FREQUENTLY ALWAYS

Comments – 49% commented.

This was scored with a value of 1 for NEVER, and 5 for ALWAYS.

Low workload	mean score – 3.5, (ie, 'more than sometimes, less than frequently') sd – 0.9
About right	mean score – 3.7, (ie 'more than sometimes, less than frequently') sd – 0.8
High	mean score – 2.8, (ie 'more than rarely, less than sometimes') sd – 0.8

End of Section 4

SECTION 5

AREA NAVIGATION FACILITIES ON BOARD THE AIRCRAFT

14 **In your opinion, how easy or difficult is the area navigation system to use?**

Easy Difficult

1 2 3 4 5 6 7 8 9 10

Comments – 49% commented.

Mean score	3.6
Standard deviation	2.3

15 **Does the area navigation system give you ....**

	Never									Always
Adequate information.....	1	2	3	4	5	6	7	8	9	10
Timely information.....	1	2	3	4	5	6	7	8	9	10
Accurate information.....	1	2	3	4	5	6	7	8	9	10
Reliable information.....	1	2	3	4	5	6	7	8	9	10

Comments – 42% commented.

	Mean	Standard deviation
Adequate information	7.7	1.7
Timely information	7.5	1.8
Accurate information	7.0	1.9
Reliable information	6.8	2.0

16 **How easy or difficult is it to understand the information?**

Easy									Difficult
1	2	3	4	5	6	7	8	9	10

Mean	Standard deviation
3.1	2.0

17 **During flight, how much workload does navigation impose on you?**

a. **Area navigation workload is LOW**

NEVER RARELY USUALLY FREQUENTLY ALWAYS

b. **Area navigation workload is ABOUT RIGHT**

NEVER RARELY USUALLY FREQUENTLY ALWAYS

c. **Area navigation workload is HIGH**

NEVER RARELY USUALLY FREQUENTLY ALWAYS

Comments. – 37% commented

This was scored with a value of 1 for Never, 5 for Always.

Workload low – mean score – 3.2 (ie, 'more than usually, less than frequently) sd 0.8
About right - mean score – 3.3 (ie, 'more than usually, less than frequently) sd 0.7
High - mean score – 2.3 (ie, 'more than rarely, less than sometimes) sd 0.7

18 **Are your answers to the questions about area navigation affected to a great extent by the particular navigation kit fitted to your aircraft?**

This question has been summarised as those who liked or disliked a particular navigation system. A few disliked one and liked another. GPS was eagerly awaited by many, but they had no current experience.

System liked	Count	System disliked	Count
RNAV2	31	DECCA	2
RNAV	19	TANS	11
RNAV1	13	GNS	4
GPS	12	RNAV1	4
DECCA	1	GPS	2

19 **Also, have you had experience of navigation systems that are different from the one fitted to this aircraft?**

NONE	11%	RNAV 1	35%	RNAV 2	37%
DECCA MARK 19	56%	DECCA	2%	GNS	18%
TANS	38%	GPS	36%	TRIMBLE	12%
GARMIN 55	5%	GARMIN 100	5%	GARMIN	1%
BENDIX KING	1%	BENDIX	1%	LITTON	1%
TRACOR	1%	TIME ARC	1%	TNL	1%
GP5500	1%	PORTABLE	1%	LORAN	2%
VLF	2%	OMEGA	3%	ROMAN 80	1%
MINITANS	1%	DANAC	3%	LOMAN	1%
DOPPLER	1%	DECTRAC	1%	VLS	1%
DOPPLER TANS	1%	TACCUM	1%	CAZUR	1%

20 **Of the navigation systems that you have used, which ones do you prefer, and why?**

Preferred System	Count
RNAV1	61
RNAV2	118
GPS	60
DECCA	2
Other	7

End of Section 5

SECTION 6

SUPPORTING SERVICES

21 **In general, do the following provide you with adequate information, in a timely manner?**

a. **Pre-flight planning aids, for example MIST, or navigation computers**

	Never									Always
Adequate information.....	1	2	3	4	5	6	7	8	9	10
Timely information.....	1	2	3	4	5	6	7	8	9	10

Comments – 62% commented.

	Mean	Standard deviation
Adequate information	6.7	1.9
Timely information	5.9	1.9

b. **Met. when flight planning**

	Never									Always
Adequate information.....	1	2	3	4	5	6	7	8	9	10
Timely information.....	1	2	3	4	5	6	7	8	9	10

Comments – 50% commented.

	Mean	Standard deviation
Adequate information	6.7	1.8
Timely information	6.1	2.0

c. **Met. available when airborne**

	Never									Always
Adequate information.....	1	2	3	4	5	6	7	8	9	10
Timely information.....	1	2	3	4	5	6	7	8	9	10

Comments – 50% commented.

	Mean	Standard deviation
Adequate information	6.0	2.2
Timely information	5.5	2.2

d. **Air Traffic Services en-route to platforms....**

	Never									Always
Adequate information.....	1	2	3	4	5	6	7	8	9	10
Timely information.....	1	2	3	4	5	6	7	8	9	10

Comments – 46% commented

	Mean	Standard deviation
Adequate information	7.6	1.6
Timely information	7.6	1.7

e. **Air Traffic Services in the vicinity of platforms.....**

	Never									Always
Adequate information.....	1	2	3	4	5	6	7	8	9	10
Timely information.....	1	2	3	4	5	6	7	8	9	10

Comments – 54% commented.

	Mean	Standard deviation
Adequate information	5.7	2.2
Timely information	5.6	2.2

f. **Airfield or helideck conspicuity aids.**
Are the markings of the airfield or helideck at your base ...

EXCELLENT	14%
GOOD	37%
ADEQUATE	37%
INADEQUATE	8%
POOR?	5%

Comments – 42% commented.

This was scored with a value of 1 for Excellent, 5 for poor; therefore the higher the score, the worse the conspicuity aids.

End of Section 6

SECTION 7

DURING FLIGHT.....

22 **Do weather conditions ever cause you high workload or safety hazards during flight?**

	Never									Always
High workload.....	1	2	3	4	5	6	7	8	9	10
Safety hazard	1	2	3	4	5	6	7	8	9	10

Comments – 47% commented.

	Mean	Standard deviation
Workload	6.2	2.0
Safety hazard	5.0	2.2

23 **Does the activity of calculating load or fuel requirements during flight cause high workload or a safety hazard?**

	Never									Always
High workload.....	1	2	3	4	5	6	7	8	9	10
Safety hazard	1	2	3	4	5	6	7	8	9	10

Comments – 40% commented.

	Mean	Standard deviation
Workload	5.2	2.2
Safety hazard	3.7	2.1

24 **Does the activity of filling out paperwork cause high workload or a safety hazard during flight?**

	Never									Always
High workload.....	1	2	3	4	5	6	7	8	9	10
Safety hazard	1	2	3	4	5	6	7	8	9	10

Comments – 56% commented.

	Mean	Standard deviation
Workload	6.0	2.3
Safety hazard	4.7	2.5

25 **The 'in-flight' Nav Log/Flt Log design is.....**

Poor Excellent

1 2 3 4 5 6 7 8 9 10

Comments – 28% commented.

Mean	Standard deviation
6.3	1.9

26 **Is the Nav Log/Flt Log easy or difficult to understand?**

Easy Difficult

1 2 3 4 5 6 7 8 9 10

Comments – 13% commented.

Mean	Standard deviation
3.2	2.1

27 **In your opinion, how much duplication of entries is required by your paperwork?**
(*Please circle as appropriate*)

NONE
LOW
ACCEPTABLE
HIGH
UNACCEPTABLY HIGH

Comments – 29% commented.

This was scored with a value of 1 for None, 5 for Unacceptably High.

Mean	Standard deviation
3.4	1.0

Paperwork duplication was on the High side of Acceptable.

28 **During flight, to what extent do late changes in load, or to your planned route, necessitate changes to paperwork that has already been completed?**

NEVER RARELY SOMETIMES FREQUENTLY ALWAYS

Comments – 29% commented.

This was scored with a value of 1 for Never, 5 for Always.

Mean	Standard deviation
3.4	0.7

29 **Does the timeliness with which you receive the information required to complete the paperwork, cause high workload or a safety hazard?**

	Never									Always
High workload	1	2	3	4	5	6	7	8	9	10
Safety hazard	1	2	3	4	5	6	7	8	9	10

Comments – 36% commented.

	Mean	Standard deviation
Workload	5.8	2.2
Safety hazard	4.1	2.4

30 **Do you have any suggestions about how to reduce workload which is caused by late changes to the expected loads, or to your planned route?**

Suggestion	Count
It's part of the job	46
Provide Routes / Info. Earlier	46
Educate Oil Companies / Reduce Commercial Pressure	22
Computerise / Automate System	19
Do Paperwork On Deck	12
Employ Old Staff / Train New	12
6 P's	3
Passed To Brent Log	3
Crew Discipline	1

31 **Please consider the overall effect of 'in-flight' paperwork on your workload.**

a. **'In-flight' paperwork causes a SLIGHT INCREASE in my workload**

NEVER RARELY SOMETIMES FREQUENTLY ALWAYS

b. **'In-flight' paperwork causes a MODERATE INCREASE in my workload**

NEVER RARELY SOMETIMES FREQUENTLY ALWAYS

c. **'In-flight' paperwork causes a HIGH INCREASE in my workload, SUCH THAT IT INTERFERES WITH OTHER TASKS**

NEVER RARELY SOMETIMES FREQUENTLY ALWAYS

d. **'In-flight' paperwork causes a VERY HIGH INCREASE in my workload, SUCH THAT IT BECOMES A SAFETY HAZARD**

NEVER RARELY SOMETIMES FREQUENTLY ALWAYS

This was scored with a value of 1 for Never, 5 for Always.

Slight increase – mean 3.2 (ie, 'more than sometimes') sd 0.9.
Moderate increase – mean 3.2 (ie, 'more than sometimes') sd 0.8.
High increase – mean 2.7 (ie, 'more than rarely, less than sometimes') sd 0.9.
Very high increase – mean 1.8 (ie, 'almost never) sd 0.9.

32 **How much do you think your workload would be improved if late changes to the 'in-flight' paperwork were eliminated?**

Not at all — All workload problems would vanish

1 2 3 4 5 6 7 8 9 10

Comments – 24% commented

Mean	Standard deviation
6.1	2.4

33 **Does 'in-flight' paperwork affect any other aspect of the trip?**

Category	Number
Breakdown of monitoring / CRM / look-out in flight	35
No / No effect	32
Problems with stowage / design / use of Nav. log / board	15
Miscellaneous comments	13
Problems with clutter / time to find paperwork	8
Frustration	8
Breakdown of monitoring / look-out on deck	8

34 **Which aspects of your 'in-flight' paperwork do you feel COULD usefully be replaced by an automated system?**

Category	Number In Priority 1
Load / Shuttle Sheets	66
Take Off / Landing	27
Flight Plans / Navigation Log	24
Fuel Loads	15
Manifests	15
Do Not Like / Trust Automation	15
Weather	9
Changes To Route	7
Check List	5
Technical / Other Logs	3
Other	1

35a. **Does the storage and physical handling of paperwork in the cockpit cause any difficulties?**

Comment	Count
Storage Problems / lack of stowage space	78
Too Much Paper / volume of paperwork to be handled	36
Clipboard Stowage	24
Problems of paperwork accessibility / manipulation	17

35b. **Are there any other problems with paperwork (in general) that cause difficulties? For example, the manifest sheet, flight planning, load sheet etc.**

Comment	Count
Too Much Paperwork	45
Manifest Format	34
Lack of Standardisation Of Forms	15
No Paperwork When Preparing To Fly	12

35c. **Have you any suggestions as to how these difficulties could be reduced?**

Comment	Count
Standardise Forms	48
Cut Down On Duplicated Paperwork	30
Automation / Computers	21
More Storage Space	5

36 **Have you had any experience of using other systems of paperwork that are better than the one you use now?**

Comment	Count
Electric Recording / Computer	18
Others Are Not Good	15
Basic Nav Log (Tick Boxes)	14
No Paper Systems	6
Shuttle Load Sheets	2

37 **Please feel free to use the following space to suggest ways in which your paperwork could be improved.**

Comment	Count
Single Sector Sheets / Relevant Boxes / Less Boxes / No Duplication	28
Eliminate Paperwork Use RNAV Out Of Cockpit	23
Combined Tech / Log Loadsheet	15

End of Section 7

SECTION 8

PLATFORM BASED TOPICS

8a. STANDARD OF HLO SERVICE

38 **Does the standard of service provided by the HLO cause a high workload or a safety hazard?**

	Never									Always
High workload	1	2	3	4	5	6	7	8	9	10
Safety hazard	1	2	3	4	5	6	7	8	9	10

Comments – 54% commented.

	Mean	Standard deviation
Workload	3.8	1.8
Safety hazard	3.7	2.0

8b. RIG IDENTIFICATION

39 **Please consider the ease with which rigs can be identified from the air.**

a. **IDENTIFICATION IS EXCELLENT, it is easy to see the name (or other identification) from an appropriate distance on all approaches.**

This statement applies .....

NEVER RARELY SOMETIMES FREQUENTLY ALWAYS

b. **IDENTIFICATION IS OF AN ACCEPTABLE STANDARD. The rigs can be identified from a suitable distance most of the time.**

This statement applies .....

NEVER RARELY SOMETIMES FREQUENTLY ALWAYS

c. **IDENTIFICATION IS POOR. You sometimes have to be close before you are sure which rig it is.**

This statement applies .....

NEVER RARELY SOMETIMES FREQUENTLY ALWAYS

d. **IDENTIFICATION IS UNACCEPTABLY POOR. There is danger of committing to landing before being sure which rig it is.**

This statement applies .....

NEVER RARELY SOMETIMES FREQUENTLY ALWAYS

Comments – 49% commented.

This was scored with a value of 1 for Never, 5 for Always.

Identification excellent – mean 2.4 (ie 'a little more often than rarely')	sd 1.
Identification acceptable – mean 3.0 (ie 'sometimes')	sd 1.
Identification poor – mean 3.5 (ie 'more than sometimes, less than frequently')	sd 0.8.
Identification unacceptably poor – mean 2.5 (ie 'a little more often than rarely')	sd 0.9.

8c. THE HELIDECK ENVIRONMENT

40 **Does the helideck lighting cause you a high workload or a safety hazard at night?**

	Never									Always
High workload.....	1	2	3	4	5	6	7	8	9	10
Safety hazard	1	2	3	4	5	6	7	8	9	10

Comments – 53% commented.

	Mean	Standard deviation
Workload	5.2	2.3
Safety hazard	4.7	2.3

41. **How easy or difficult is it generally to see the position of the helideck on the platform IN DAYLIGHT?**

Easy									Difficult
1	2	3	4	5	6	7	8	9	10

Mean	Standard deviation
3.9	2.0

42 **How easy or difficult is it generally to see the position of the helideck on the platform AT NIGHT?**

Easy									Difficult
1	2	3	4	5	6	7	8	9	10

Mean	Standard deviation
6.6	2.3

43 **Are the visual cues (such as the lighting), that help you to position your aircraft during the APPROACH to the helideck, generally poor or good?**

	Poor									Good
During daylight.....	1	2	3	4	5	6	7	8	9	10

	Poor									Good
At night.....	1	2	3	4	5	6	7	8	9	10

Comments – 40% commented.

	Mean	Standard deviation
Daylight	6.5	2.2
Night	4.1	2.2

44 **Are the visual cues (such as the lighting), that help you to position your aircraft during the HOVER, and WHILST LANDING ON the helideck, generally poor or good?**

	Poor									Good
During daylight.....	1	2	3	4	5	6	7	8	9	10

	Poor									Good
At night.....	1	2	3	4	5	6	7	8	9	10

Comments – 28% commented.

	Mean	Standard deviation
Daylight	7.3	1.8
Night	5.6	2.2

45 **Is the quality of flood lighting on the helidecks generally poor or good.?**

Poor									Good
1	2	3	4	5	6	7	8	9	10

Comments – 30% commented.

Mean	Standard deviation
5.3	2.3

46 **Do other lights on the platforms interfere with your ability to see the helideck at night?**

	Never									Always
Lighting interferes.....	1	2	3	4	5	6	7	8	9	10

Comments – 40% commented.

Mean	Standard deviation
6.2	2.4

47 **Does turbulence around the platforms cause you a high workload or a safety hazard?**

	Never									Always
High workload.....	1	2	3	4	5	6	7	8	9	10
Safety hazard	1	2	3	4	5	6	7	8	9	10

Comments – 51% commented.

	Mean	Standard deviation
Workload	6.4	2.0
Safety hazard	5.9	2.5

End of Section 8

SECTION 9

MISCELLANEOUS

COMMERCIAL PRESSURE

48 **Does commercial pressure cause you high workload or safety hazard?**

	Never									Always
High workload.....	1	2	3	4	5	6	7	8	9	10
Safety hazard	1	2	3	4	5	6	7	8	9	10

Comments – 36% commented.

	Mean	Standard deviation
Workload	4.6	2.3
Safety hazard	3.6	2.3

STANDARDISATION BETWEEN OIL COMPANIES ON THE NORTH SEA

49 **Different oil companies have different rules, (for example, concerning how and when passengers don their protective clothing). How does this influence your workload during the trip?**

a. **The level of workload attributable to non standardisation of passenger procedures is LOW.**

This statement applies.....

NEVER RARELY SOMETIMES FREQUENTLY ALWAYS

b. **The level of workload attributable to non standardisation of passenger procedures is MODERATE.**

This statement applies.....

NEVER RARELY SOMETIMES FREQUENTLY ALWAYS

c. **The level of workload attributable to non standardisation of passenger procedures is HIGH.**

This statement applies.....:

NEVER RARELY SOMETIMES FREQUENTLY ALWAYS

d. **The level of workload attributable to non standardisation of passenger procedures is VERY HIGH.**

This statement applies.....

NEVER RARELY SOMETIMES FREQUENTLY ALWAYS

Comments – 34% commented.

This was scored with a value of 1 for Never, 5 for Always.

Low –	mean 3.3 (ie, more than sometimes, less than frequently)	sd 1.0.
Moderate –	mean 2.8 (ie, more than rarely, a little less than sometimes)	sd 0.9.
High –	mean 2.3 (ie, a little more than rarely)	sd 1.0.
Very high –	mean 1.7 (ie, less than rarely)	sd 0.9.

ROSTERS

50 **Do you consider that any elements of the flight time limitations rules (for example, their effect on shift patterns) affect your ability to cope with high workload?**

Comment	Count
Consecutive Early Starts / Fatigue	73
Bad Rostering	44
JAA Proposals Are Concerning	15
Cap 371 Is OK	10

51 **Do you have any other problems with your work schedule that affect your workload?**

Comment	Count
Fatigue / Bad Shift Patterns	22
Changing Rosters	21
Early Starts	16
Not Enough Spare Time / No Crew Cover	7
Planning Workload	6

ALL ASPECTS OF WORKLOAD

52 **Finally please sit back and consider all the aspects of your job that impact on your workload; (*hopefully this questionnaire has touched on most of them*). List them in order of importance with regard to their contribution to your overall workload.**

Factor	Priority 1	Priority 2	Priority 3	Priority 4	Priority 5
In Flight and duplication of paperwork	55	50	51	30	15
Weather/met procedures	54	31	24	17	8
Rostering	34	27	15	9	8
Standard Nav aids and Ergonomics	31	22	16	14	8
Aircraft handling/fuel	13	13	11	9	8
Pre and in – flight planning	10	9	5	7	3
Safety/survival (mainly suits)	9	6	4	9	7
Flight time limitations	7	-	-	2	2
Management	6	3	9	6	9
Localised Nav and radio problems	6	20	8	9	7
Employment security	6	4	1	3	3
Helidecks	5	21	23	9	7
Commercial pressures	5	5	6	9	14
Training and crew compatibility	4	4	8	2	3
Air traffic environment	4	11	4	2	6
Procedure stress	3	4	-	-	-

53 **What do you consider to be the major safety concerns associated with North Sea or Irish Sea helicopter operations?**

Some questionnaires contained more than one concern, all are included.

Category	Number
Dissatisfaction with the air traffic environment en-route and at the vicinity of installations.	72
Airworthiness integrity, dangers from flying in poor weather and sea states, and probability of unsurvivable ditching.	70
Cockpit workload (including administrative workload) and need for systems to ease crew tasks.	48
Flight time limitations (particularly JAA scheme) and fatigue issues.	44
Offshore installations; marking, lighting, deck and radio operator competence, physical characteristics, unmanned installations.	37
Commercial pressures imposed by oil companies or employers.	35
Morale, job security, company attitudes.	21
Training and CRM issues	20
Poor met reporting and forecasting.	19
Helicopter performance capability	18
CAA under regulation	16
Icing clearances	11
CAA over regulation.	6

– INTENTIONALLY BLANK –

Annex 2: Summary of Background Information

Q1 Are you a Captain of First Officer?

Rank	Number of respondents
Captain	202
First Officer	67

Q2 Which Company do you work for?

Company	Number of respondents
Company A	63
Company B	113
Company C	92
Company D	1

Q3 From where do you operate?

Operating Base	Number of respondents
Aberdeen	172
Beccles	11
Sumburgh	20
Liverpool	5
Safe Gothia	3
North Denes	28
Blackpool	6
Humberside	14
Other	8

Q4 For how long have you been operating over the North Sea and/or the Irish Sea?

Years Operating	Number of respondents
Less Than 2	7
2 to 5	50
More Than 5	211

Q5 What are your total flying hours of North Sea and/or Irish Sea operations?

Total Flying Hours	Number of respondents
0 – 1000	16
1000 – 2000	14
2000 – 3000	49
3000 – 4000	39
4000 – 5000	30
5000 – 6000	27
6000 – 7000	20
7000 – 8000	15
8000 – 9000	22
9000 -10000	15
10000 – 11000	20
11000 – 12000	2
12000 – 13000	1
13000 – 14000	0
14000 +	1

Q6 Approximately how many operational flying hours do you do each year?

Operational Hours Per Year	Number of respondents
0 – 100	12
100 – 200	4
200 – 300	16
300 – 400	29
400 – 500	34
500 – 600	89
600 – 700	60
700 – 800	22
800 +	5

Q7(i) What is the total duration of the return trip that you fly most frequently?

Duration Of Trip	Number of respondents
Less Than 1	15
1 to 2	76
More Than 2	176

Q7(ii) and typically, how many off-shore landings would this involve?

Off-Shore Landings	Number of respondents
1	33
2	102
3	54
4	17
5	7
6	6
7	3
8	4
9	0
10	4
11	1
12	4
13	2
14	0
15	10
16	1
17	5
18	1
19	0
20	6

Q8 What type of aricraft do you fly most frequently?

Helicopter	Number of respondents
Bell 214	6
Bell 212	5
Bolkow 105	1
Super Puma	111
S61	60
S76A	16
S76A+	35
S76B	2
S76C	4
AS.365N	22
ASN2	6
AS332	1

Q9 Which area navigation facility is fitted to this aircraft?

Navigation System	Number of respondents
None	0
RNAV1	131
RNAV2	99
Decca Mark 19	7
Omega	6
TANS	19
GPS	6

Q10 Does this aircraft have an AFCS/Autopilot, or other flight stabilising system, coupled or uncoupled, flight director system, or perhaps none of these?

AutoPilot	Number of respondents
AFCS	139
AutoPilot	111
Other	
Honeywell	2
Bell SCAS	2
SCAS	3
Hamilton	2
Simple	1
Height Hold	1
ASE	2
Pitch/Roll	1
SAS	1
ALT	2
FD	1

Q11 Please indicate whether you are completing this questionnaire from the point of view of single pilot operations or two pilot operations.

One/Two	Number of respondents
Single Pilot	12
Two Pilot	256

Annex 3: Summary of question responses

Question	Number of responses	Mean	Standard Deviation
12 a i – Does Cockpit Temperature cause High Workload? (never....always)	264	3.636	2.217
12 a ii – Does Cockpit Temperature cause a Safety Hazard? (never....always)	267	4.307	2.413
12 b i -Does Cockpit Lighting cause High Workload? (never....always)	266	3.703	2.331
12 b ii -Does Cockpit Lighting cause a Safety Hazard? (never....always)	264	3.530	2.310
12 c i – Does Cockpit Misting cause High Workload? (never....always)	266	3.906	2.456
12 c ii – Does Cockpit Misting cause a Safety Hazard? (never....always)	265	4.468	2.722
12 d i – Do Cockpit Visibility difficulties cause High Workload? (never....always)	219	4.447	2.593
12 d ii – Do Cockpit Visibility difficulties cause a Safety Hazard? (never....always)	220	4.900	2.868
12 e i – Does the Layout Of Controls cause High Workload? (never....always)	264	2.875	1.937
12 e ii – Does the Layout Of Controls cause a Safety Hazard? (never....always)	266	2.895	2.122
12 f i – Do Displays cause High Workload? (never....always)	263	3.449	2.230
12 f ii -Do Displays cause a Safety Hazard? (never....always)	263	3.323	2.261
12 g i – Does the Design Of Seat cause High Workload? (never....always)	264	4.019	2.779
12 g ii – Does the Design Of Seat cause a Safety Hazard? (never....always)	265	4.038	2.667
12 h i – Do Immersion Suits cause High Workload? (never....always)	260	4.519	2.653
12 h ii – Do Immersion Suits cause a Safety Hazard? (never....always)	261	4.605	2.589
12 i i – Does Other Personal Equipment cause High Workload? (never....always)	209	3.153	2.257
12 i ii – Does Other Personal Equipment cause a Safety Hazard? (never....always)	210	3.429	2.648
13a. Aircraft handling workload is LOW (NEVER/RARELY/SOMETIMES/FREQUENTLY/ ALWAYS)	261	3.464	0.8921
13b. Aircraft handling workload is ABOUT RIGHT (NEVER/RARELY/SOMETIMES/FREQUENTLY/ ALWAYS)	258	3.651	0.8195
13c. Aircraft handling workload is HIGH (NEVER/RARELY/SOMETIMES/FREQUENTLY/ ALWAYS)	260	2.750	0.8024
14. In your opinion, how easy or difficult is the area navigation system to use? (Easy...difficult)	265	3.577	2.257

15 a. Does the area navigation system give you .adequate information	266	7.711	1.697
15 b. Does the area navigation system give you timely information	265	7.502	1.834
15 c. Does the area navigation system give you .accurate information	267	7.037	1.877
15 d. Does the area navigation system give you .reliable information	267	6.753	2.033
16. How easy or difficult is it to understand the information? (easy....difficult)	267	3.082	2.036
17 a. Area navigation workload is LOW (NEVER=1; RARELY=2; USUALLY=3;FREQUENTLY=4; ALWAYS=5)	261	3.165	0.8365
17 b. Area navigation workload is ABOUT RIGHT(NEVER=1; RARELY=2; USUALLY=3;FREQUENTLY=4; ALWAYS=5)	266	3.278	0.7253
17 c. Area navigation workload is HIGH(NEVER=1; RARELY=2; USUALLY=3;FREQUENTLY=4; ALWAYS=5)	264	2.295	0.6948
21 a i – Adequate Information From Pre-Flight Planning Aids Or Navigation Computers (never...always)	260	6.658	1.940
21 a ii – Timely Information From Pre-Flight Planning Aids Or Navigation Computers (never...always)	259	5.915	1.992
21 b i – Adequate Information From Met. When Flight Planning (never...always)	262	6.748	1.887
21 b ii – Timely Information From Met. When Flight Planning (never...always)	262	6.118	2.005
21 c i – Adequate Information From Met. When Airborne (never...always)	266	5.962	2.161
21 c ii – Timely Information From Met. When Airborne (never...always)	265	5.475	2.164
21 d i – Adequate Information From Air Traffic Services En-Route To Platforms (never...always)	265	7.630	1.619
21 d ii – Timely Information From Air Traffic Services En-Route To Platforms (never...always)	265	7.555	1.651
21 e i – Adequate Information From Air Traffic Services In Vicinity Of Platforms (never...always)	257	5.732	2.178
21 e ii – Timely Information From Air Traffic Services In Vicinity Of Platforms (never...always)	257	5.556	2.152
21 f. Are the markings of the airfield or helideck at your base EXCELLENT=1;GOOD;ADEQUATE;INADEQUATE; POOR=5)	265	2.525	0.9887
22 i – Do Weather Conditions ever cause High Workload (never...always)	262	6.229	1.894
22 ii – Do Weather Conditions ever cause a Safety Hazard (never...always)	261	5.038	2.213
23 i – Does the activity of calculating Load/Fuel Requirements cause High Workload (never...always)	262	5.214	2.220
23 ii – Does the activity of calculating Load/Fuel Requirements cause a Safety Hazard (never...always)	261	3.674	2.080

24 i –	Does the activity of filling out Paperwork cause High Workload (never...always)	264	6.034	2.253
24 ii –	Does the activity of filling out Paperwork cause a Safety Hazard (never...always)	262	4.706	2.464
25.	The 'in-flight' Nav Log/Flt Log design is.(poor=1...excellent=10)	261	6.333	1.887
26.	Is the Nav Log/Flt Log easy or difficult to understand?(easy=1...difficult=10)	263	3.163	2.069
27.	In your opinion, how much duplication of entries is required by your paperwork? (NONE=1; ACCEPTABLE; HIGH; UNACCEPTABLY HIGH=5)	264	3.428	0.9644
28.	During flight, to what extent do late changes in load, or to your planned route, necessitate changes to paperwork that has already been completed? NEVER=1 ,RARELY, SOMETIMES, FREQUENTLY, ALWAYS=5)	267	3.375	0.7473
29 i.	Does the timeliness with which you receive the information required to complete the paperwork, cause high workload? (never....always)	262	5.836	2.174
29 ii.	Does the timeliness with which you receive the information required to complete the paperwork, cause a safety hazard? (never....always	262	4.073	2.378
31 a.	'In-flight' paperwork causes a SLIGHT INCREASE in my workload (NEVER=1, RARELY, SOMETIMES, FREQUENTLY, ALWAYS=5)	256	3.613	0.9303
31 b.	'In-flight' paperwork causes a MODERATE INCREASE in my workload (NEVER, RARELY, SOMETIMES, FREQUENTLY, ALWAYS)	259	3.197	0.7700
31 c.	'In-flight' paperwork causes a HIGH INCREASE in my workload, SUCH THAT IT INTERFERES WITH OTHER TASKS (NEVER, RARELY, SOMETIMES, FREQUENTLY, ALWAYS)	263	2.665	0.9007
31 d.	'In-flight' paperwork causes a VERY HIGH INCREASE in my workload, SUCH THAT IT BECOMES A SAFETY HAZARD (NEVER, RARELY, SOMETIMES, FREQUENTLY, ALWAYS)	260	1.854	0.8620
32.	How much do you think your workload would be improved if late changes to the 'in-flight' paperwork were eliminated? (Not at all.... All workload problems would vanish)	258	6.120	2.412
38 i.	Does the standard of service provided by the HLO cause a high workload? (never...always)	253	3.787	1.833
38 ii.	Does the standard of service provided by the HLO cause a safety hazard? (never...always)	253	3.711	1.968
39 a.	RIG IDENTIFICATION FROM THE AIR IS EXCELLENT, it is easy to see the name (or other identification) from an appropriate distance on all approaches. (NEVER=1, RARELY, SOMETIMES, FREQUENTLY, ALWAYS=5)	263	2.361	0.9585

39 b.	RIG IDENTIFICATION FROM THE AIR IS OF AN ACCEPTABLE STANDARD. The rigs can be identified from a suitable distance most of the time. (NEVER, RARELY, SOMETIMES, FREQUENTLY, ALWAYS)	262	2.981	0.9726
39 c.	RIG IDENTIFICATION FROM THE AIR IS POOR. You sometimes have to be close before you are sure which rig it is. (NEVER, RARELY, SOMETIMES, FREQUENTLY, ALWAYS)	262	3.477	0.8197
39 d.	RIG IDENTIFICATION FROM THE AIR IS UNACCEPTABLY POOR. There is danger of committing to landing before being sure which rig it is. (NEVER, RARELY, SOMETIMES, FREQUENTLY, ALWAYS)	261	2.456	0.9297
40i.	Does the helideck lighting cause you a high workload at night? (never...always)	258	5.186	2.306
40ii.	Does the helideck lighting cause you a safety hazard at night? (never...always)	256	4.699	2.324
41.	How easy or difficult is it generally to see the position of the helideck on the platform IN DAYLIGHT? (Easy=1; difficult=10)	262	3.870	1.965
42.	How easy or difficult is it generally to see the position of the helideck on the platform AT NIGHT? (Easy=1; difficult=10)	262	6.576	2.274
43i.	Are the visual cues (such as the lighting), that help you to position your aircraft during the APPROACH to the helideck in daylight, generally poor or good? (Poor=1; good=10)	257	6.525	2.169
43ii.	Are the visual cues (such as the lighting), that help you to position your aircraft during the APPROACH to the helideck at night, generally poor or good? (Poor=1; good=10)	261	4.061	2.165
44i.	Are the visual cues (such as the lighting), that help you to position your aircraft during the HOVER, and WHILST LANDING ON the helideck in daylight, generally poor or good? (Poor=1; good=10)	259	7.278	1.815
44ii.	Are the visual cues (such as the lighting), that help you to position your aircraft during the HOVER, and WHILST LANDING ON the helideck at night, generally poor or good? (Poor=1; good=10)	261	5.625	2.244
45.	Is the quality of flood lighting on the helidecks generally poor or good.? (Poor=1; good=10)	256	5.297	2.285
46.	Do other lights on the platforms interfere with your ability to see the helideck at night? (Never=1; always=10)	260	6.242	2.351
47i.	Does turbulence around the platforms cause you a high workload? (Never=1; always=10)	259	6.355	2.043
47ii.	Does turbulence around the platforms cause a safety hazard? (Never=1; always=10)	258	5.915	2.494
48i.	Does commercial pressure cause you high workload? (Never=1; always=10)	259	4.587	2.343

48ii.	Does commercial pressure cause a safety hazard? (Never=1; always=10)	258	3.593	2.331
49 a.	The level of workload attributable to non standardisation of passenger procedures is LOW. (NEVER=1, RARELY, SOMETIMES, FREQUENTLY, ALWAYS=5)	255	3.325	1.000
49b.	The level of workload attributable to non standardisation of passenger procedures is MODERATE. (NEVER=1, RARELY, SOMETIMES, FREQUENTLY, ALWAYS=5)	254	2.803	0.8939
49c.	The level of workload attributable to non standardisation of passenger procedures is HIGH. (NEVER=1, RARELY, SOMETIMES, FREQUENTLY, ALWAYS=5)	252	2.270	0.9853
49 d.	The level of workload attributable to non standardisation of passenger procedures is VERY HIGH. (NEVER=1, RARELY, SOMETIMES, FREQUENTLY, ALWAYS=5)	252	1.702	0.8624