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Research paper

Assessment on risk management of helicopter services for offshore installations

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Abstract

The lack of research on risk assessment and awareness among authorized personnel handling helicopters at Malaysian offshore installations has been addressed in a recently-submitted review. The Air Accident Investigation Bureau (AAIB) and Civil Aviation Authority (CAA) has strongly recommended all helicopter companies to improve significantly on their helicopter maintenance, particularly for the ones involving offshore operations. From the perspectives of trainers in an approved training organization such as Universiti Kuala Lumpur - Malaysian Institute of Aviation Technology (UniKL MIAT), this issue has been raised among both training staffs and students. As a benchmark for everyone involved, a comprehensive questionnaire on both risk assessment and risk awareness has been developed and distributed to 15 highly-experienced helicopter handlers from five different respectable offshore installations. The analyzed results have determined that there is a significant correlation between the knowledge of risk assessment and perception on risk awareness among helicopter maintenance personnel on offshore installations.

Keywords: *risk assessment; risk awareness; helicopter maintenance; offshore installations.*

1. Introduction

The data on helicopter accident during offshore installation by the House of Common's Transport Committee is shown in Figure 1. It shows that between the years 1975 and 2014, 73 rotorcraft accidents have been recorded under the jurisdictions of offshore authorities within United Kingdom (UK). 13 of those accidents have resulted in fatalities. The number of casualties reached 38 cases for oil amongst oil and gas companies' personnel alone. Coincidentally, Super Puma rotorcrafts were the ones that had been significantly damaged or destroyed in the last five incidents, listed as follow:

- Despite the fact that every last one of the 18 survivors had made it out alive during the traumatic event heading east towards Aberdeen, AAIB authorities dictated the damaged EC225 rotorcraft could have been saved if the maintenance personnel had zero error in maintaining the alert system back in February 2009
- The horrific crash in the North Sea that took place in the month of April, 2009, had caused the death of every personnel who boarded the AS332 rotorcraft due to a malfunctioned gearbox
- A repeat of EC225 incident traumatically occurred back around mid-year 2012within the vicinity of Aberdeen coastal radius. The event that affected all 14 survived victims was indicated as an aftereffect of another problematic gearbox.
- Unfortunately, the same EC225 gearbox caused another huge problem a few months after. For this particular incident, AAIB personnel had found out that the gearbox system now had functioned off a broken shaft while carrying 19 passengers before it crashed in the sea near Shetland
- A total of four deaths was informed by AAIB regarding to the crash of AS332 near Shetland – inquiries have yet to finish.

As observed in the above list, the House of Common's Transport Committee has published that gearbox was a critical issue for the said incidents[1].

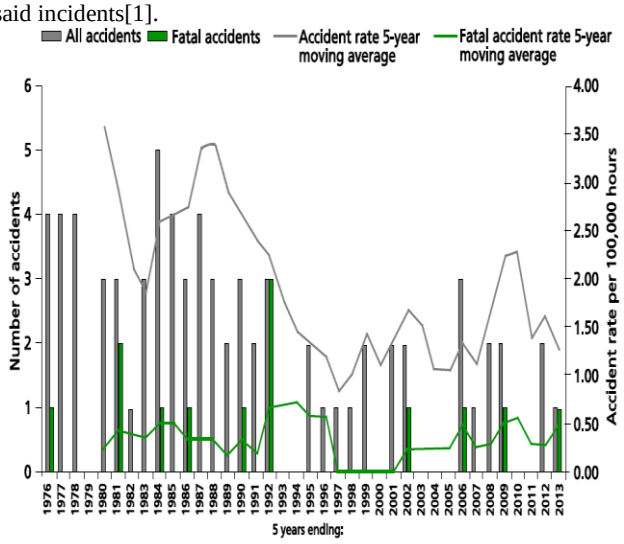

Fig. 1: Accident rates between 1976 and 2013 [1]

Ellman *et al.* (2014) have welcomed effort by experts from the aviation world to study and collaborate with the personnel who are working at the oil rigs in the sea to resolve the continuing concerns regarding this particular rotorcraft model. But, it has been proven that through meetings, discussions and interviews, it seems to be significantly caused by a negative work culture of arrogance and psychological dominance amongst the said industry.

Hence, researchers hope that this continuous effort of maintaining the highest professionalism levels in terms of moral values and work ethics would be regulated and continued to encourage honesty and accessibility necessary in the name of total safety. This is the reason why Civil Aviation Authority ("CAA") initiated the much- needed, full audit on SOPs of ensuring rotorcraft protection in the sea – this was triggered by the horrific Sumburgh incident [1].

After extensive reviewing processes and studies, "CAA" has informed the results to the public and these results had included revisions and additions in many areas, including maintenance, governance, and airworthiness of all aircrafts utilized under the launch of "Offshore Helicopter Safety Action Group". With that, major domains that needed significant amount of revisions, upgrades and modifications have been highlighted, e.g. unique clients' needs regarding piloting crews and helicopter seats for aircraft and company personnel involved.

The investigation has shown that the operator of the aircraft does not properly follow the safety regulations during briefing. The operator has taken for granted that everything is in a good order until accident happens. This causes the stakeholders to lose revenues by losing contracts from offshore installations companies. With that in mind, researchers have tried to accumulate data of all fatal and non-fatal helicopter accidents and correlate the findings with specific types of helicopter operations. However, this cannot be done extensively and particularly in Malaysia as detailed accident reports regarding registered accidents have never been made public, and only general details can be viewed in several media reports and independent forums [2-5].

2. Malaysian offshore helicopter services

The differences between two almost-similar offshore terms are distinguished by the following definitions [6]:

- Helicopter operations on offshore installation services (Civil Aviation Publication 437)
  - There would potential life-or-death jeopardy whenever a rotorcraft operates for carrying oil rigs personnel into the sea
  - Which mainly involves newer oil rigs' setup where the quality assurance is astronomically high but the rotorcraft would pose that life-or-death jeopardy
- Normal offshore installation services (AOC)
  - Standard way of travelling towards oil rigs in the sea because of the established efficiency despite experiencing uncertainties in terms of climate conditions
  - Rotorcraft has been studied and informed by researchers to indicate higher index values in terms of improving health and poses lower risks, especially concerning usual problems whilst travelling for hours above the sea.

Helicopter operating companies have duties under the Air Navigation Order (ANO) [7] and must obtain an Air Operator's Certificate (AOC) prior to initiating flight procedures. SOPs, rules and regulations need to be adhered to in all possible aviation contexts [6]. The high-profile stakeholders have shown significantly to business performance such as:

- It has been made known that rotorcraft piloting crews and personnel received negative treatments because of their clients' connections with industry players
- Last-minute tender assignments and work schedule with unfair payable fees and payments was also expressed

Currently in Malaysia, there is lack of research on the risk assessment and awareness among authorized personnel that handling helicopter at offshore installations. The two major transports companies, which are MHS and Weststar, are transporting oil and gas personnel from land to offshore installation every day and week. The issue is that the knowledge of the importance of risk assessment and awareness has never been measured among the authorized personnel handling helicopter landing at offshore installations. Risk assessment is an instrument that has been used in majority of aviation companies either during maintenance, repair and overhaul, or during the aircraft operation. The awareness is another factor that needs to be taken seriously by having all personnel aware what risk is all about and how to identify, analyse and mitigate the risk.

There are many utterances by organizations that have called for a halt of the operations due to technical problem and failure to comply with the best practice of SOP (Risk assessment Matrix (RAM):

- Space for landing deck configuration
- Insufficient area to provide a 'ground cushion' from the rotor downwash
- Financial constraint in organization
- Lack of competent pilot to fly the helicopter

Failure to comply with the best practice of SOP will cause accidents. Many accidents happened largely during offshore installation and data of reported accidents have been gathered from 1976 to 2002, which are summarized as follow [8]:

- There have been seven fatal accidents that have caused the death of 88 offshore personnel and flight crew
- 50 non-fatal accidents have been recorded in this span of 26 years

These numbers exclude unregistered accidents and the ones that occurred post-2002. The major cause for helicopter accidents in general is helicopter personnel violated regulations as reported recently by International Helicopter Safety Team [9]. The SOP should also advise the needed action(s) for the helicopter operations as per Review of Helicopter Airworthiness (HARP Report – CAP 491) [10] and Aircraft Maintenance Engineer's Logbook – CAP 471 [11] due to the environment such as winds, waves and others:

- Excessive wind turbulence due to adjacent structure
- Process thermal effects (i.e. turbine exhausts, normal and also emergency)
- Obstructions in approach and departure sectors

3. Survey and correlation analysis

For this paper, the issue about the safety, as well as risk management, of helicopter landings at offshore installation is discussed. There are many instances of which accidents happen largely during offshore installation that may be imposed of many possible management systems and this proves to be an issue due to its imposed risk. Currently, it is considered an issue because there are many utterances by organizations that call for a halt of operations. This research will shed a light on the importance of safety and risk management of the issue, not just because of human factors but due to the environment as well. As there are also included factors that put risk to the marine life and to humans that belong to this work environment, one of those factors is fire, which transfers in many mediums. The interference of nature such as winds, waves and others could potentially strengthen the heat flux as well as the effects on the establishments. Failures that take place during helicopter landings on offshore installation can pose a real threat that will likely become a fire incident. The importance of making a mathematical model for fire distribution could be apprehended for this case given that offshore installation usually involves with oil [12], a large factor that can cause fire if helicopter landing accidents take place.

Today, there are two helicopter companies which operate to provide support for major offshore installations in Malaysia. They are:

- MHS Aviation Berhad [13]
  - Providing helicopter services to oil and gas companies
  - Leading provider of helicopter transport services as well as emergency medical services, and search and rescue for the Malaysian oil and gas industry

- Provide aircraft charter for helicopters and aeroplanes as well as flight training. Engineering and technical services
- Weststar Aviation Services Sdn Bhd [14]
  - Catering to oil and gas industry in Malaysia since 2008 with a 5-year contract to provide offshore transport services for Carigali Hess
  - Became the largest offshore service provider in the South East Asian region when it was awarded a contract to provide nine AW139 helicopters for five prominent oil and gas companies

The null hypothesis was *there is no correlation between the understanding of risk assessment and awareness among helicopter handler.* The value of *r* from Pearson's Correlation would be the indicator for accepting or rejecting this null hypothesis. The three-part questionnaire, which has been produced based on the risk assessment criteria [15] and the risk awareness scopes [16], is intended to confirm the null hypothesis. The answers are arranged in a Likert-scale with "1" being *Strongly Disagree* up to "5" being *Strongly Agree*. After the α-cronbach is indicated at 0.959, the researcher has proceeded by personally meeting and handing the questionnaire to 15 highly-experienced helicopter maintenance personnel (either at MHS Aviation Berhad or Weststar Aviation Services Sdn. Bhd.) from five different offshore installations. From these 15 male personnel, 60% of them are offshore handlers, 26.7% are professional engineers and the remaining 13.3% are platform superintendents. The perceptions between the knowledge of risk assessment and perception on risk awareness on the survey were tested using correlation test. The *r* (Pearson Correlation) value is shown in Table 1 and results on hypothesis test are shown in Table 2.

Table 1: Pearson correlation between knowledge on risk assessment and perception on risk awareness

		Knowledge on Risk Assessment	Perception on Risk Assessment
Knowledge on Risk Assessment	Pearson Correlation	1	.982**
	Sig. (2-tailed)		.000
	N	15	15
Perception on Risk Assessment	Pearson Correlation	.982**	1
	Sig. (2-tailed)	.000	
	N	15	15
**. Correlation is significant at the 0.01 level (2-tailed).			

Table 1 shows that Pearson Correlation value between knowledge of risk assessment and perception on risk awareness is 0.982, significant at 0.01 level (2 –tailed). Therefore, there is very strong correlation between the knowledge of risk assessment and perception on risk awareness.

Table 2: Research hypothesis

Hypothesis	Status
H_0 1: There is no relationship between the knowledge of risk assessment and perception on risk awareness	Rejected

Table 2 shows that the null hypothesis will be rejected, indicating there is a very strong correlation between the knowledge of risk assessment and perception on risk awareness. The study has shown that the level of knowledge on risk assessment of the helicopter handler at offshore installation is at 4.08 or at 81.6%. The knowledge on risk assessment is very important factor that need to be a continuous effort to ensure that all helicopter handler to be knowledgeable. This can be done through routine yearly training on the risk assessment. The perception on risk awareness of helicopter handler at offshore installation is at 4.09 or at 81.8%. The awareness of the helicopter handler needs a constant evaluation because without awareness, an accident can occur that can cost life. The awareness can be done through display reminder board everywhere at the installation.

The correlation between knowledge on risk assessment and perception on risk awareness has been measured using SPSS to find Pearson's Correlation (*r*) value from the survey that had been conducted. The *r* value is at 0.982, which is very strong between knowledge on risk assessment and perception on risk awareness.

4. Conclusion

Both domains are affecting each other in terms of maintenance performance by helicopter handlers. Without knowledge, the awareness will be very low to none. Therefore, the possibility of an accident to occur will be very high. In the light of this, UniKL MIAT trainers will ensure that their students under helicopter training programmes [17] will be more alert regarding risk awareness and risk assessment even while studying as a significant preparation for the real world in their future undertakings.

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