Short communication

AVIATION SAFETY: HELIDECK SURFACE FRICTION MANAGEMENT AND MAINTENANCE FOR SAFE HELICOPTER OPERATIONS

ABSTRACT:
In the Aviation industry, helicopters provide an important medium of transportation of passengers, cargo, and provision of specialized services especially to the oil and gas sector of the economy. Various operators exist within Nigeria, some of the key operators include Bristow helicopters, Caverton group, OAS helicopters, Nestav, Eastwind Aviation and a few other operators. These companies operate a variety of helicopter types like the SK 76, AW139, AW189, SK 92 etc. These aircrafts typically take off from Airports or client onshore bases to various locations including the offshore sites such as Oil rigs, Oil tankers, Jack ups semi submersibles, Floating Production and Storage Offloading (FPSO) vessels, Seismic vessels etc. Many of these offshore sites have helicopter landing platforms-Helidecks, capable of serving different helicopter types based on their design and the dimensions of the aircraft. These helidecks play a critical role in offshore operations, serving as landing and take-offs structures on platforms for helicopters. Surface friction, management, and maintenance are paramount considerations in ensuring the safety and efficiency of personnel and helideck operations. This paper presents an exploration of the challenges associated with helideck surfaces, the importance of friction management, strategies for effective maintenance, and a brief discussion of the benefits of graphene in significantly improving the characteristics of helideck surfaces, ensuring compliance to the provisions of the UK CAA CAP 437 Edition 9. The paper will explore the importance of helideck surface friction, how friction values are determined, and the need for stakeholders to act on helideck surface degradation to mitigate risks, enhance safety, and optimize operational performance.

KEYWORDS: Helideck, helicopters, surface friction, maintenance, risk mitigation, safety.

INTRODUCTION

The helideck structure is designed to allow a landing space that is safe and suitable for the largest and heaviest helicopter that is expected to land on the helideck (Park et al, 2016). A very important part of this design is the helideck surface friction. This is a critical safety consideration in the designing of a helideck.
Ensuring sufficient friction on the helideck surface is crucial to avoid skidding or sliding of the helicopter, the helideck crew, and the passengers, while conducting helicopter operations.
Helideck surfaces are designed to guarantee maximum friction. This entails selecting suitable materials with the appropriate texture and roughness, as well as incorporating effective drainage mechanisms to avoid water collection on the surface. Regular maintenance and management of the helideck surface is needed to maintain the required friction (El-Reedy, 2015). Periodic examinations of the helideck surface should be carried out to detect any indications of deterioration and loss of friction. If any possible concerns are detected, it is necessary to implement suitable actions to restore or enhance the friction of the surface. These actions may encompass tasks like cleansing, administering anti-skid coatings, or rectifying any impaired sections of the helideck surface.
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THE IMPORTANCE OF SURFACE FRICTION

Slippery surfaces are a significant contributor to workplace accidents resulting from falls, accounting for around 20% to 40% of reported serious injuries in developed countries (Park et al, 2008). This is part of the reasons why helideck surface friction should be seriously considered.
To ensure optimal helideck surface friction, it is recommended to conduct routine inspections, perform regular cleaning, apply anti-skid coatings, and promptly repair any sections that have been damaged. By applying these techniques, the coefficient of friction of the helideck surface can be adjusted, hence lowering the likelihood of accidents caused by skidding or sliding. Management and Safety of Friction on Helideck Surfaces is essential to ensure the safety of helicopter operations. To ensure safe helicopter operations, it is crucial to have a thorough grasp of the components that contribute to the maintenance and control of helideck surface friction. Aside from

routine inspections, cleaning, and the application of anti-skid coatings, it is crucial to thoroughly examine the materials and construction techniques employed for the helideck surface. The selection of appropriate materials and textures, along with the implementation of effective drainage systems, not only impacts surface friction but also plays a crucial role in preventing water buildup. This is important as water accumulation can undermine the friction and safety of helicopter operations. Moreover, a comprehensive comprehension of the environmental variables that can impact the helideck surface, including meteorological conditions and any pollutants, is essential for efficient maintenance and administration. By considering these elements and executing thorough techniques to uphold and oversee helideck surface friction, the overall safety of helicopter operations can be greatly enhanced.

Figure 1: helicopter Landing on an offshore helideck.

EVALUATING THE FRICTION OF HELIDECK SURFACES

The UK CAA CAP 437 Edition 9 document contains the coefficient values for friction. This document offers instructions on the maximum permissible helideck motion, guaranteeing the maintenance of safe thresholds, even on decks with a high friction coefficient. A helideck landing net can be installed to augment for reduced friction offshore provided a minimum average surface friction of 0.5 is achieved across the surface of the helideck.

Section of helideck	Fixed helideck	Moving helideck
Inside TD/PM circle	0.6	0.65
TD/PM circle and H painted markings	0.8	0.65
Outside TD/PM circle and parking areas	0.5	0.5

Figure 2: Helideck friction requirements.

There are typically two types of helidecks, when it comes to friction testing: profiled helidecks and flat helidecks.

The profiled helidecks are made up of extruded aluminium planks with ribbed surface with an optional provision for micro-texture finish, which require full scale testing at an independent test facility.

The flat helidecks would require periodical friction tests with a Continuous Friction Measuring Equipment (CFME) usually annually or biennial should the resulting values exceed the resulting values of Table 1, UK CAA CAP 437 Edition 9. The equipment widely accepted is the Findley Irvine micro grip tester.

The Findley Irvine Micro Grip Tester is an invaluable instrument for evaluating and enhancing the grip of helideck surfaces. The Findley Irvine Micro Grip Tester is specifically engineered to deliver accurate and dependable measurements, enabling you to make well-informed decisions regarding maintenance and

enhancements to optimize the total surface grip. This device analyses the coefficient of friction on the helideck's surface, providing crucial data for evaluating its grip capability. The Micro Grip Tester allows for precise assessment of the existing friction level of the helideck surface, enabling the identification of regions that may require enhancement.
Using this data, you may strategically adopt steps such as putting anti-skid coatings or conducting repairs in certain regions to enhance friction and assure the safety of helicopter operations.
Integrating the Findley Irvine Micro Grip Tester into your routine maintenance routines for helideck safety can greatly enhance the overall management and safety of the helideck surface. By utilizing this innovative equipment to test and enhance the grip of the helideck surface, you can enhance the safety of helicopter operations and reduce the risks associated with insufficient surface friction.

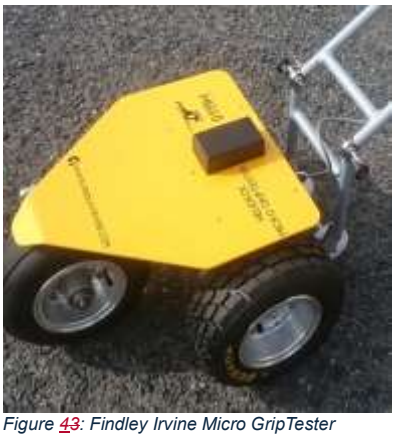

Figure 43: Findley Irvine Micro GripTester

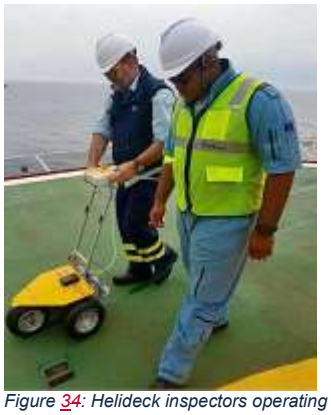

Figure 34: Helideck inspectors operating the Findley Irvine equipment.

HELIDECK SURFACE ENHANCEMENTS

A popular method for ensuring sufficient helideck surface friction is the combination of blasting technique and the addition of abrasives, this method is widespread. In recent times, new builds have employed aluminium helidecks.
Rust formation is a common issue in offshore environments, particularly in structures exposed to saltwater and harsh weather conditions. Employing corrosion protection measures, such as coatings or cathodic protection systems, can help extend the service life of helideck surfaces and minimize maintenance requirements.

Figure 5: helideck surface degradation around the tie-down points.

Innovatively, research has shown that graphene-based additives are been used. Graphene is a highly promising substance that may be added to improve the ability of surfaces to stick together and increase the friction between them. This has shown itself to be particularly useful in applications such as helideck surfaces. The helideck surface can be improved by utilizing its distinctive characteristics, which include superior strength, flexibility, and outstanding electrical and thermal conductivity. graphene and its functionalization such as pristine graphene, graphene oxide, fluorinated graphene has been shown to be good considerations for adhesion and as a surface friction modifier (Zeng et al, 2018b).

Graphene, when added to coatings or composite materials for helideck surfaces, can greatly enhance adhesion and enhance the surface's traction. The two-dimensional structure of the helideck surface acts as a barrier that improves the grip between the surface and the helicopter landing gear, hence lowering the chances of skidding, or sliding during operations.

Moreover, using modified graphene can help avoid water collection on the helideck surface. This is because graphene's hydrophobic properties enable it to repel water, ensuring that the surface remains dry.

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Then add some shortcomings of the existing methods and summarize them.

Consequently, the surface friction is maintained even in wet conditions, enhancing safety. By investigating the use of graphene as an additive to boost adhesion and surface friction on helideck surfaces, operators can improve the safety and dependability of helicopter operations, ultimately creating a secure environment for helicopter landings and take-offs. the square of the length of the air gap.

Figure 6: Degradation of helideck surface around the Touchdown and position marking circle leading to reduced surface friction.

RISK MITIGATION AND MANAGEMENT

It is crucial to consider the influence of helideck motion on the level of surface friction. The mobility of the helideck can have a substantial impact on the friction and safety of helicopter operations. Hence, it is imperative to consider the destabilizing impact of helideck motion while assessing and controlling helideck surface friction. The permissible range of vessel motion for conducting helicopter operations safely is often specified in the operations handbook of the helicopter service provider.

When it comes to preserving the surface friction of a helideck, it is essential to thoroughly examine the materials and construction techniques employed. The selection of materials and textures, together with the incorporation of effective drainage systems, is crucial for both enhancing surface friction and reducing water buildup, which could jeopardize the safety of helicopter operations.

Furthermore, a comprehensive comprehension of the environmental variables that can impact the helideck surface is necessary. It is crucial to consider weather conditions and potential pollutants when adopting maintenance and management plans, since they can directly affect surface friction.

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Implementing regular maintenance schedules is crucial for preserving the safety of helidecks. Regular inspections and assessments of the helideck surface allow for the identification of potential difficulties and the implementation of suitable solutions to maintain or enhance surface friction. This proactive strategy minimizes the likelihood of mishaps caused by skidding or sliding during helicopter operations.

CONCLUSION

Developing and executing a comprehensive maintenance program for a helideck is an essential approach to guarantee efficient helideck management is the implementation of a routine maintenance program that encompasses the monitoring and documentation of the helideck's condition. It is necessary to do routine inspections both before and after helicopter operations to detect any problems or indications of damage on the helideck surface. To maintain optimal surface friction, it is essential to incorporate regular cleaning and debris removal into the maintenance program. Periodically resurfacing the helideck may be necessary to maintain its excellent frictional qualities.

There is no publicly accessible data of aviation incidents caused partly or wholly by poor helideck surfaces. It may be necessary for stakeholders to create accessible records to detect trends and implement appropriate corrective measures.

Assessing the traction of a helideck surface requires a thorough methodology that considers multiple factors including helideck materials used, geographical location, weather conditions, and routine maintenance. By thoroughly examining these factors, the overall safety of helicopter operations can be greatly improved, guaranteeing the secure arrival and departure of helicopters.

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