

13 March 2020

Follow-up on FOD finds relating to runway lights at CPH

Introduction

This is a summary of main findings and conclusions relating to FOD (Foreign Object Debris) from runway lights found at Copenhagen Airport (CPH) in 2018 and 2019. It also provides a description of the initiatives that either already have been or will be launched in the matter. An occurrence report has been prepared in the matter. It was prepared by CPH's occurrence investigators in accordance with current EU rules on reporting, analysis and follow-up on incidents in civil aviation with a view to improving aviation safety.

The actual report was submitted to the Danish Transport, Construction and Housing Authority ("TBST") in January 2020 and was prepared for learning purposes and within the framework of the 'just culture' principles, which means, *inter alia*, that employees should be able to freely provide information and contribute their expertise. The occurrence report inherently contains sensitive personal data and is thus classified as confidential. Accordingly, this summary does not go into every detail. It is CPH's responsibility to ensure that we do not compromise on the duty of confidentiality by disclosing staff-related or other sensitive and protected information.

Aviation safety is a priority above all else

Aviation safety is a priority second to none in CPH's day-to-day operations. Risk is inherent to aviation, and the core of our work on aviation safety is to reduce that risk continually and as much as possible. The risk can never be fully eliminated, considering the considerable power involved during aircraft take-offs and landings. However, thanks to ongoing and very intense and thorough safety-enhancement efforts, the risk has been reduced to a level that makes aviation much more safe than other means of transportation. As a result of the ongoing safety efforts of CPH, the airlines and other partners at the airport, traveling from Copenhagen Airport is very safe, and this has also been the case in recent years.

A very low tolerance threshold applies when it comes to safety at the airport manoeuvring area. For example, runway inspections are conducted by specially trained staff five times every 24 hours. These inspections are conducted in accordance with applicable procedures, during which marshalls, bird controllers and other specially trained staff inspect, *inter alia*, pavement, lighting and signage. All employees of CPH, the airlines and partners working in the manoeuvring areas are fully trained in appropriate conduct in the area. It goes without saying that CPH pays specific attention to the training of its own employees and how they approach the various situations that may arise. This includes, for example, FOD found in the manoeuvring area. CPH receives about 900 occurrence reports each year, all of which are handled and processed for learning purposes and for the purpose of building skills and know-

how at the airport to better detect and prevent potential risks to aviation safety. Some ten to fifteen of these occurrence reports are subject to a more thorough occurrence investigation performed by CPH's independent occurrence investigators. The occurrence investigators are employed by CPH, but their professional and objective independence of other members of management is assured by the regulatory control of the government and the TBST.

It is inherent to sound safety culture that CPH ensures that all relevant occurrences are reported and processed for purposes of learning and continual improvement of aviation safety.

It is on this background that CPH reports FOD findings and has specifically reported FODs related to runway lights in 2018 and 2019. CPH has on its own initiative conducted a more in-depth analysis as addressed in an occurrence report which was subsequently validated by an external aviation safety expert. In addition, and as is always done in important matters, a number of technical investigations have been performed with a view to obtaining further learning and to improving future maintenance work and ensuring a proper risk and safety level.

The objective of the occurrence report was to ensure full and in-depth coverage of the occurrence and on how similar occurrences can be avoided in future. The objective was not to place a specific responsibility, as such an approach would be counterproductive to the objective of a sound safety culture as described in Danish law. Past experience shows that in cases where the focus is on determining and placing responsibility, employees may refrain from fully contributing any knowledge they may have. That could potentially have serious and negative consequences for the learning and safety culture which must be present in companies providing critical safety assignments such as Copenhagen Airport. Any erroneous approach to the reporting could directly contribute to increasing unsafe conduct, which could compromise aviation safety.

Report on and reasons for FOD occurrences related to runway lights in 2018 and 2019

CPH reported five FOD episodes relating to runway lights to the TBST in the period June 2018 to September 2019. There were two episodes in 2018, in June and September, and a total of three episodes in 2019, in August and September.

[Edited – see Danish version for map of the incidents]

Four of the episodes involved the top part of a dislodged light fitting, while one involved a fixed runway light with loose bolts. In connection with the episode on 22 August 2019, all light fittings on runways 22L/04R, 22R/04L, 12/30 and on taxiways were systematically checked and tightened. The inspection revealed loose bolts at about 50 fixed fittings on the runways and at about 30 fixed fittings on taxiways, and that in some instances bolts were missing altogether. There are more than 2100 runway lights on the six runways alone. There are a total over 9000 runway lights in the airport's manoeuvring area. No additional episodes involving FOD from runway lights were reported during the period and no new episodes relating to runway lights have been recorded other than those already known.

The individual episodes involving runway lights were given immediate operational attention and solved individually. The episodes led to runway closures and extraordinary runway inspections, and in several instances a particular individual inspection was conducted of all bolts in runway lights in the areas involved. All such actions were taken

for the purpose of ensuring that the area in question would not be open for air traffic until found operationally safe.

In connection with the episodes occurring during the weekend of 14 to 15 September 2019, CPH decided to conduct an investigation in order to analyse and follow up on the episodes. The resulting report was supplemented by a technical occurrence report involving, among other things, a dialogue with CPH's supplier of runway lights, and a number of extensive external lab tests were conducted in association with a firm of technology experts in order to fully investigate the runway light challenges.

Systemic reasons for FOD episodes relating to runway lights

The occurrence report points out that CPH failed to respond quickly and efficiently enough to understand and address the underlying correlations of the episodes involving FODs relating to runway lights. The challenges involving runway lights is based on a combination of factors, for which reason the occurrence report is unable to identify one specific event, function or employee that may have caused it. The occurrence investigators concluded that complex systemic weaknesses and a number of inexpedient organisational circumstances have evolved over a number of years which combined have contributed to the runway light challenges. The occurrence report concludes, *inter alia*, that, if possible, it should be more clearly defined who is to register and act to identify such correlations at an earlier point in time.

At the same time, it was established that CPH operated under a calculated category A risk for a period of about 24 hours during the weekend of 14 to 15 September 2019 even though this is not acceptable according to CPH's Safety Management System.

The classification was determined by CPH's Safety & Crisis Management department in connection with the statutory report submitted to the TBST on 16 September 2019. A category A risk arises on a combination of a potentially serious event assessed to be 'highly serious' with a probability of a worst case outcome once every ten years (rare).

The occurrence report establishes that management failed to sufficiently ensure that the staff had routines and an awareness of how a matter such as this – at a calculated category A risk – was to be escalated through the CPH organisation. As a result, management was not sufficiently aware that a category A situation had arisen and for a period of about 24 hours did not address the situation at a strategic level. The matter was only handled from an operational perspective. Accordingly, management did not perceive the risk to be serious enough for a decision to close the airport grounds to be made. CPH believes that in such a situation an emergency contingency organisation would have been established to address the challenges at strategic level, and that full or partial closure of the runways would have occurred for a duration of a few hours at most.

The occurrence report concludes that none of the parties involved had actively decided or accepted continuing operations under the *perception* that this was a category A situation.

A more systemic treatment was not initiated until 17 September when a task force decided, on the basis of an action plan that had been implemented, that the airport grounds were adequately safe for operations to continue while the action plan was being executed. Effective from 19 September, CPH was able to collect data and identify trends based on the

situation at the position of each individual light fitting – data able to support that the approved plan was being followed.

It follows that the above illustrates the chain of command and procedures for this specific situation were not good enough. CPH has already addressed this matter by setting up unambiguous guidelines for how a similar situation must be addressed in future, including for ensuring the correct escalation through the organisation and the correct procedural handling of such risk.

Technical reasons

The technical report, which included specialist, external expertise and advice, reveals that a factor contributing to the loose bolts and loose fittings was the fact that for a period of time during the ongoing maintenance process the fittings were tightened with too much tension. As a result the bolt thread lost part of its optimal robustness causing the life of the fitting to be reduced. This was only learned during the investigation process.

A contributory factor is that CPH had not itself established sufficiently clear instructions and a standard correct tightening procedure, nor had CPH specifically required of the supplier that the supplier provide a clear description of this process. CPH has subsequently, in association with the supplier and leading experts, defined new requirements for future tightening and maintenance procedures to ensure that the robustness and life of the fittings remain intact.

Previous initiatives implemented and future initiatives

Apart from the fact that the five episodes were handled immediately and addressed from an operational perspective involving runway closures and inspections as well as repairs, CPH has since September 2019 launched a number of additional initiatives for safety improvement purposes in addition to the five daily ordinary runway inspections.

In connection with the most recent episodes, on 14 and 15 September 2019, runway electricians performed a thorough retightening check of all critical runway lights at the airport. Since 17 September, a stricter procedure for monitoring both critical and other fittings has been in force. As a result, the stricter monitoring procedure and retightening checks of critical fittings were performed every 48 hours during the period until December 2019.

As the clarity of conclusions to the technical reporting has increased, CPH has steadily improved and adjusted these checks, and a large number of bolts in existing fittings have been replaced, while other fittings have been replaced altogether. These efforts have made it possible to reduce the frequency of checks since December 2019 with a fair safety margin to a weekly check.

Based on the findings of the technical reporting, CPH's management has decided to replace the bottom parts in 2000 of the 9000 runway lights at the airport in order to maintain a satisfactory safety standard. The actual replacements must take place in temperatures of at least 10 degrees to ensure optimal casting conditions. This means the replacement work cannot be performed until April 2020. The project is expected to be completed by autumn 2020, and in the meantime CPH will perform stricter checks to obtain the necessary safety assurance and monitoring of the runway lights at the airport.

Safety recommendations currently being implemented

In order to ensure learning and to improve CPH's safety efforts, the occurrence report provides a number of recommendations in accordance with applicable guidelines. The recommendations have resulted in a total of 31 actions that may be grouped in four tracks and categorised under the headlines set out below. Each track contains a number of specific actions, of which several have already been implemented, while other issues outstanding will be resolved over the coming weeks and months.

Organisation

Based on the learnings from the occurrence report, work in this track will reassess the current safety organisation with a view to improving the conditions for an ever stronger safety system at CPH. This will produce more clearly defined chains of command for follow-up purposes and actions in relation to the underlying causes of occurrences such as this one.

Procedures and structure

Work in this track will centre on the roles and responsibilities for optimising procedures, formalising chains of command and revisiting terms of reference relating to safety work at CPH with a view to ensuring an even more distinct structure and processes for handling safety-related occurrences. This will ensure that the organisation will have a precise procedure for what actions should be taken in the event of a new calculated category A risk – and to better register and address underlying trends.

Follow-up

The occurrence report identifies a need to improve surveillance, monitoring and reporting specifically to enhance the potential to identify the underlying trends of challenges as they may be discovered. This will be redressed by way of processes for active registration and trend analyses of future episodes.

Promoting safety

The fourth track will include training and promoting safety and conduct-related initiatives, all for the purpose of creating an even more robust safety culture. This track is also intended to strengthen the employees' abilities and skills to identify underlying trends for potential occurrences and situations.

True to its obligation, CPH has maintained an ongoing dialogue with TBST on the occurrence report, and CPH has submitted a list of the 31 specific actions taken in the follow up to the report. In addition, the TBST conducted inspections at CPH in December 2019 and January 2020 which did not reveal new findings involving problems with runway lights. CPH will report regularly to TBST on the progress of the above work to implement the recommendations of the occurrence report.

Statement by Thomas Woldbye, CEO of Copenhagen Airports:

“We take every single FOD seriously. We carefully register and follow up on each occurrence, and have always done so, to minimise FODs on our runways. Let there be no doubt that our ultimate goal is to completely avoid situations such as these. However, I believe it is very important that we have responded operationally to these specific episodes and have taken immediate action to ensure operational safety in each situation.”

With that said, we can see from the occurrence report that we have not responded quickly enough to understand the correlations in these episodes and that the runway lights should have been maintained differently. In addition, as a management, we have failed to sufficiently ensure that employee routines and awareness were in place for a matter such as this to be escalated through the CPH organisation in the case of the assessed category A risk in September 2019. This is clearly not satisfactory, and we must learn to do things better in the future.

We have drawn up clear plans for how we must address such matters going forward. We will do everything in our power to avoid something like this ever happening again at Copenhagen Airport. It goes without saying that we will make this learning available to the authorities and other airports should they find it relevant,” says Thomas Woldbye, CEO of Copenhagen Airports.