The GRF implementation of Beijing Capital International Airport

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1.Grasping the key points and systematically advance the preparatory work
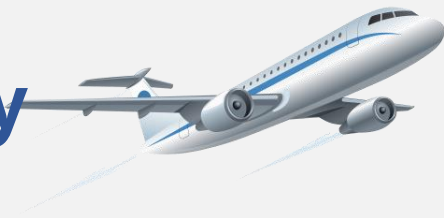
In order to ensure that the assessment and notification of the runway surface condition of the BCIA are carried out in an orderly manner, we planned and deployed in advance, and began to prepare for the relevant work on December 23, 2020. Focusing on the following aspects, the main experience can be summarized as "six ones":

# 1.Grasping the key points and systematically advance the preparatory work
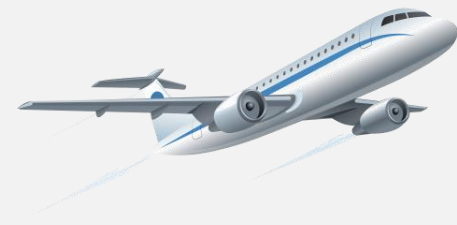
Firstly: Cultivating a professional team

According to statistics, as of November 3, 2021, a total of 5 theoretical trainings, 4 practical trainings, 110 questions on knowledge points, and 8 GRF group meetings have been held. Through the combination of theory and practice, the training and examination mode, we effectively improved the professional skills of on-site assessment personnel.
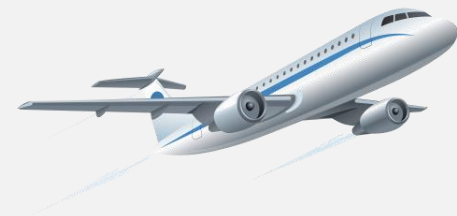
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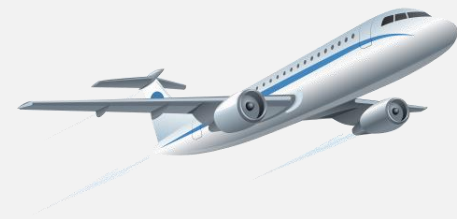
Secondly: Equiping a batch of tools and equipment

BCIA deeply analyzed the characteristics of the on-site assessment work, and provided the on-site oprators with tools, such as rulers, thermometers, and video recorders. For the problem that it is difficult to measure water depth above the pavement of rainfall in summer, in order to increase the intuition, oprators can consider using paper to distinguish the boundary at key positions such as 3 mm and 4 mm on the ruler. At the same time, combined with the summer climate characteristics, , oprators are equipped with raincoats, rain boots, goggles and other labor protection supplies. In order to ensure the real-time monitoring of the on-site situation, the vehicle is equipped with auxiliary equipment such as on-board video monitoring system and enhanced lighting.
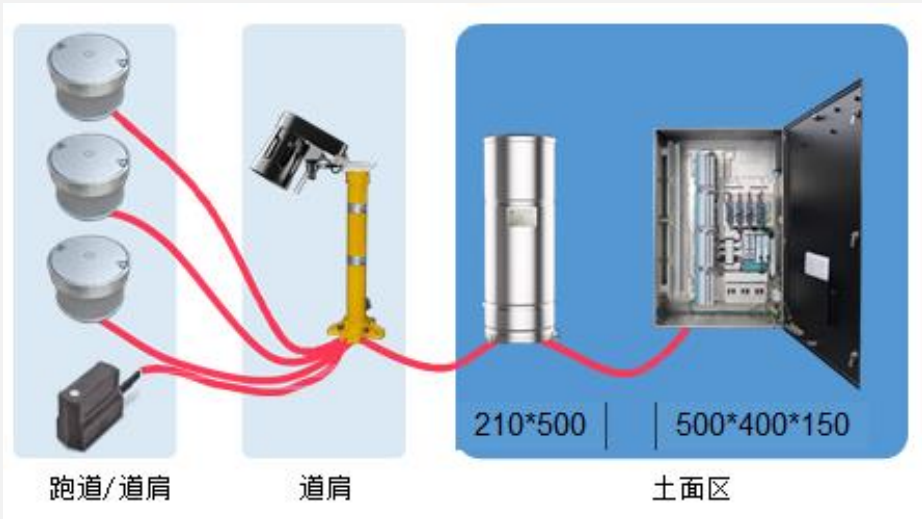
1.Grasping the key points and systematically advance the preparatory work

Thirdly：Building an auxiliary system

In May 2021, according to the future work plan of GRF, the BCIA began to build an intelligent auxiliary system for runway surface condition assessment. As of now, the system has initially provided the following functions: Firstly, the fixed station uses sensors for pavement surface monitoring, which can accurately monitor real-time changes of runway conditions, obtain datas on the temperature, humidity, water depth, and snow depth on the runway surface, and transmit them to the monitoring center. The second is that the mobile station intergrated with the detection radar equipment which is installed on the front of the vehicle, and continuously and linearly collects and uploads the pavement surface water and snow data within the vehicle's driving track. Thirdly, the software systems record on-site video, real-time data and alarm information throughout the process, establish a full-process database, and realize the full traceability of the assessment process.

1. Grasping the key points and systematically advance the preparatory work
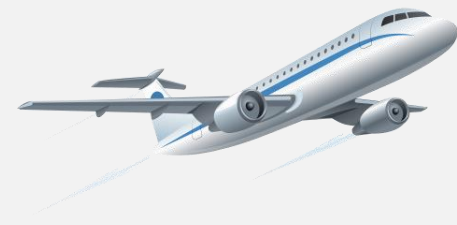
Fourthly：Establishing a set of communication mechanism

BCIA has established a special GRF communication mechanism with the Civil Aviation Air Traffic Management Bureau of North China, airlines and other relevant organizations. Several special meetings have been held to jointly study relevant documents of CAAC, understand the work process of all parties, fill in the knowledge gaps of all parties, ensure that the work process is scientific and reasonable, and ensure that the communication of all parties is smooth.
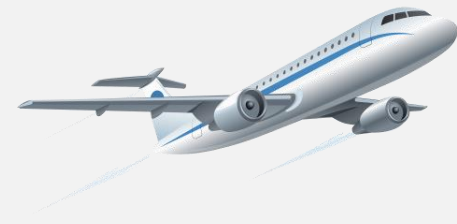

ATM Meeting

Airlines Meeting

two times，at June 23, September 2，2021   three times，at April 23, July 6, August 26，2021

1.Grasping the key points and systematically advance the preparatory work

Fifthly：Concluding a working agreement

Combined with the actual operation of BCIA, through full discussion and negotiation by all parties, consensus was reached on the procedures for getting in and out of the runway, standard communication, information notification mechanism, and notification release. Finally We signed a relevant work agreement with the Civil Aviation Air Traffic Management Bureau of North China。

Sixthly:Programing a set of risk control measures.

The BCIA conducts special risk assessment work for GRF, the identified risks mainly cover personnel skills, the process of getting in and out of the runway, standard communication, vehicle breakedown, and tools left on the runway, and programed scientific and effective risk management and control measures to ensure that risks are controllable.
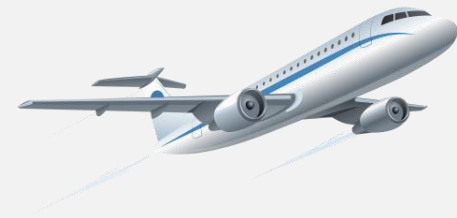
2.Grasping the core and Carrying out GRF in an orderly manner
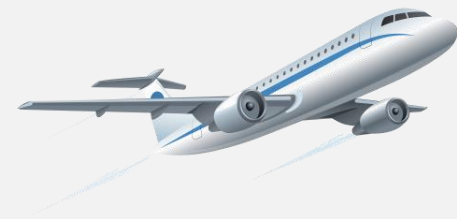
Firstly: Focusing on the runway and Carrying out GRF exercises.

We had improved the "Working Procedures of GRF at BCIA" based on the experience of runway surface condition assessment in the winter of 2020, and invited experts from the GRF research group to conduct a comprehensive review of the procedure. Taking into account the characteristics of summer weather, We conducted 63 on-site assessments of the runway surface conditions and 12 joint exercises with ATC. The runway drainage performance was good, and there was no water accumulation. Through on-site assessment, we could deeply understand the requirements of the CAAC documents, further consolidate the professional foundation of personnel, and improve the skills of operators, accumulate abundant operation experience for winter, and on October 30, 2021, the "Working Procedures of GRF at BCIA " was officially released.

# 2.Grasping the core and Carrying out GRF in an orderly manner

Secondly: Actively responding and accumulate experience.

Since the implementation of the GRF notification rules on November 4, 2021, as of December 20, We had carried out a total of 71 runway surface assessments and notifications, including 19 dry runway assessments and 52 wet and polluted runway assessments, actively inquired the crew about the braking effect of 99 sorties. The crew feedback was almost consistent with the assessment results, and no crew reported that the runway surface was not suitable or the braking effect was poor.

Thirdly: Timely review and optimizing the work.

In response to the heavy snowfall at BCIA on November 6 and 7, 2021, we actively organized the Civil Aviation Air Traffic Management Bureau of North China , Air China, Hainan Airlines, China Eastern Airlines Beijing Branch, Sichuan Airlines, Shenzhen Airlines, Postal Airlines, and Shandong Airlines Beijing Branch , SunFeng Airlines, IATA to held a special meeting on GRF review. The meeting sorted out the problems encountered in the assessment and reporting process, further optimized the work process, and improved the efficiency of the release of assessment results.

3. Focusing on difficult points and continuously improving assessment capabilities
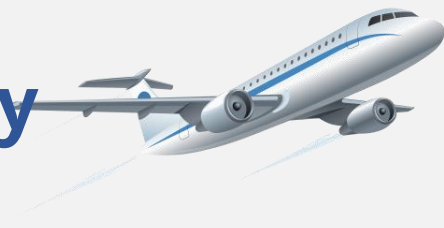
Combined with the actual operation, the next step, BCIA will focus on the following four aspects to continuously improve its assessment capabilities:

(1) In terms of multi-runway GRF and runway snow removal operations, we should further study and refine the assessment interval on the runway, grasp the changes of snow and icing on the pavement through scientific and technological means, and establish a runway emergency assessment and emergency snow removal plan.

(2) We should make full use of the GRF communication mechanism, strengthen the linkage with the on-site flight crew, controllers, and airline dispatch departments to ensure accurate information transmission and efficient response.

(3) We should continue to optimize the intelligent auxiliary system for airport runway surface condition assessment, accurately grasp the timing of runway assessment, enhance the ability to control the runway surface condition, and improve the safety margin of runway operation.

(4) We should conduct in-depth research on other airports, understand the difficulties and key points of GRF implementation, sort out problems, summarize experience, and complete the compilation of "Guidelines for Assessment and Notification of Runway Surface Conditions in Transport Airports".

4.Intelligent auxiliary system for airport runway surface condition assessment

! **CAAC's first self-developed intelligent auxiliary system for airport runway surface condition assessment**
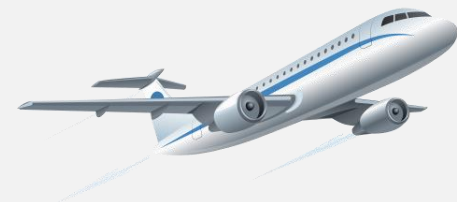
! **It is the first time in China to use this system to assist in runway surface condition assessment**

! **The system is successfully applied to the runway surface condition assessment in blizzard weather for the first time in China**
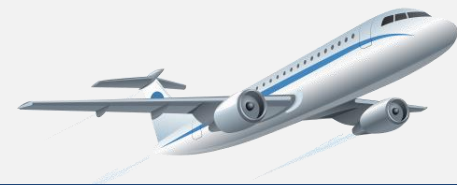
01

System Background

"The assessment shall be carried out visually, and the depth of pollutants can be confirmed by straight edge measurement. "

Four challenges!

☐ The accuracy of starting time is not guaranteed

☐ The authenticity of runway conditions is not guaranteed

☐ Flight normality is not guaranteed

☐ The timeliness of information transmission is not guaranteed

Challenge 1: there is no support for the assessment and decision-making mechanism on the runway, and the accuracy of the time to get in the runway is not guaranteed.

附件 7:

污染物的深度及重大变化阈值

污染物	报告的有效值	重大变化
积水	04, 随后评估的数值	3 毫米至 15 毫米，包括 15 毫米
雪浆	03, 随后评估的数值	3毫米至15毫米，包括15毫米
湿雪	03, 随后评估的数值	5毫米
干雪	03, 随后评估的数值	20 毫米

Challenge 2: straightedge and visual assessment are prone to deviation, and the authenticity of runway conditions is not guaranteed.

Manual measurement of pavement pollutant depth
in rainfall / snow weather (mm accurate value)
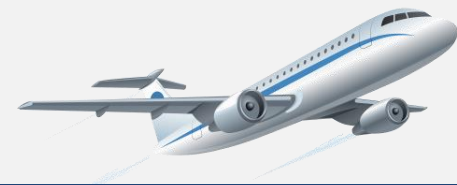
Challenge 3: extend the runway occupation time, and the flight normality is not guaranteed.
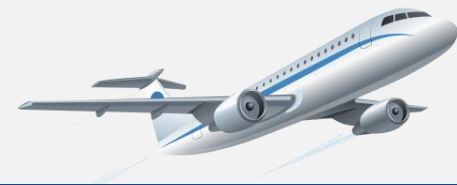
Challenge 4: the release of the report lags behind, and the timeliness of the transmission of key information is not guaranteed.

02

System Introduction

--- **GRF auxiliary system**

Challenge 1 √ ----- construction of GRF auxiliary system fixed station

The runway shall be measured by fixed station

Side lamp fixed point (pollutant range)

Embedded monitoring equipment (measuring pollutant depth and identifying pollutant type)

Mobile station auxiliary survey

App terminal automatically records collected data

Remote transmission of assessment results
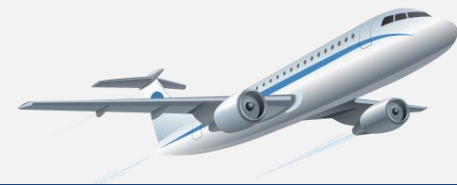
Challenge 4 √ ----- GRF auxiliary system automatically generates reports

03

System Application

On November 7, 2021, winter, the system application of BCIA in the first snowfall.

During the **46 hour** snow removal process, BCIA used the intelligent auxiliary system for runway surface condition assessment to complete a total of **15** runway condition assessments
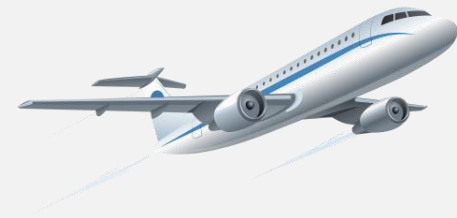
04 System Benefit

System benefit

1. The track checking time can be **shortened by 3-5 minutes**, which can be **shortened by 20 minutes** according to the calculation of track checking four times a day.

2. Accurately, timely and effectively observe the change of pollutant depth to **prevent the occurrence** of unsafe runway takeoff and landing events.

3. Form an **artificial intelligence runway condition database** to realize intelligent early warning algorithms such as automatic prediction and alarm, icing early warning and safety risk early warning.

05

System Significance

System significance

1. As the **first unit** in China to develop the intelligent auxiliary system for GRF, BCIA has mastered **the core technology** of the system in practical application.

2. After repeated debugging, the intelligent auxiliary system for runway condition assessment was successfully applied to the blizzard weather guarantee on November 7,2021. The mechanism is good, and **the preliminary results can be popularized to the whole industry.**

3. Welcome to communicate with the industry to jointly **improve safety benefits and runway operation efficiency.**

THANKS