Challenges of Aerodrome Pavement Maintenance on an Island Nation

By The Bahamas Department of Civil Aviation

Aerodrome Inspectors: Mr. Marcus A. Evans esq. and Ms. Charlestina Knowles

Our Objective

- Understand The Bahamas
- Aviation In The Bahamas
- Aerodromes in The Bahamas
- Importance of Aviation in The Bahamas
- Challenges of Pavement Maintenance
- The Treasure In Treasure Cay

Understanding The Bahamas

- **The Commonwealth of the Bahamas is an island nation located in the Atlantic Ocean.**
- **It has 700 islands and cays in the Atlantic Ocean stretching over 13,940 km². Approximately only 40 of the 700 islands are inhabited.**
- **The 2 majors cities in The Bahamas are: Nassau, which is in New Providence and the capital city and Freeport, which is in Grand Bahama.**
- **On July 10th 1973 The Bahamas gained Independence from Great Britain.**

Understanding The Bahamas

- **The Bahamas has an approximate population 380,000 people.**
- **65% of the population live on the island of New Providence (Nassau).**
- **The remaining Bahamian islands are referred to as the "Family Islands".**
- **The Bahamas is located in the Hurricane belt. Our tropical cyclone season extends from June 1st to November 30th. The weather is subtropical climate.**

Aviation in The Bahamas

Aerodromes in The Bahamas

- A total of 56 Aerodromes in The Bahamas
  - 28 Government operated
  - 28 Privately operated

- Principle Aerodromes –Typical Aircraft: Code C
  - Lynden Pindling International (Nassau, Bahamas)
  - Grand Bahama International (Freeport, Bahamas)

- Family Island Aerodromes –Typical Aircraft: Dash-8
  - Busiest Family Island aerodrome is Marsh Harbor International (Abaco, Bahamas)

Importance of Aviation in The Bahamas

- **Tourism relations account for 60% of the country's GDP. Over 65% of our visitors arrive by air.**
- **Medical emergencies on the Family Islands typically require air transport to New Providence, Freeport and neighbouring nations. Air Transport is the most efficient means of transport for medical emergencies throughout Family Island.**
- **The lack of factories and manufacturing facilities lend to the need for 78% of goods to be imported into the country. A large percentage of these are brought via air.**

Challenges in Aerodrome Pavement Maintenance

Challenges in an Island Nation

Some of the major challenges that affect aerodrome pavement and pavement maintenance in The Bahamas are:

- **Availability of necessary raw materials**
- **Mobility throughout the Family Islands**
- **Aviation Demand due to the Geometry of The Bahamas (Archipelagic Nation)**

Challenges with Raw Materials for Asphalt Concrete

Granite needs to be imported from Canada or Jamaica

- **Cost for imported Aggregate is High**
  - **$30/ton for Granite**
  - **$60/ton after shipping/ custom duty and mobilization**
- **Bitumen is also imported**
  - **$1,450/ton for Bitumen**

Challenges with Mobility

The Bahamas is a Archipelagic Nation

- **Inter-Island transport is supplied either via air or sea**
- **Most all materials from other Countries are first shipped to either Nassau or Freeport and then distributed to the Family Islands**

Transporting Material to the Family Islands

To Install Asphalt Concrete Pavement on the Family Islands one must:

- **Transport Raw Material by Barge**
- **Transport labour and provide accommodations**
- **Transport Asphalt Plant and Mobile Equipment by Barge**
- **Transports parts for equipment repair which may cause costly delays in the project**

Challenges in Aviation Demand

- **The archipelago of The Bahamas lends to a high demand for aviation traffic. With population growth and increase in economic activity, the sustainability and upkeep of the aerodrome must increase as well.**
- **The Bahamas Department of Civil Aviation has 28 airports under its operation and is solely responsible for the maintenance and upkeep of these aerodromes; along with another 28 privately own aerodromes for oversight.**
- **Resource allocation is critical to meet the demands of the 56 Aerodromes.**

The Universal Challenges of Cost

The availability of raw materials, mobility between the Family Islands and the demand on the Aviation in The Bahamas are all critical cost factors.

The Facts

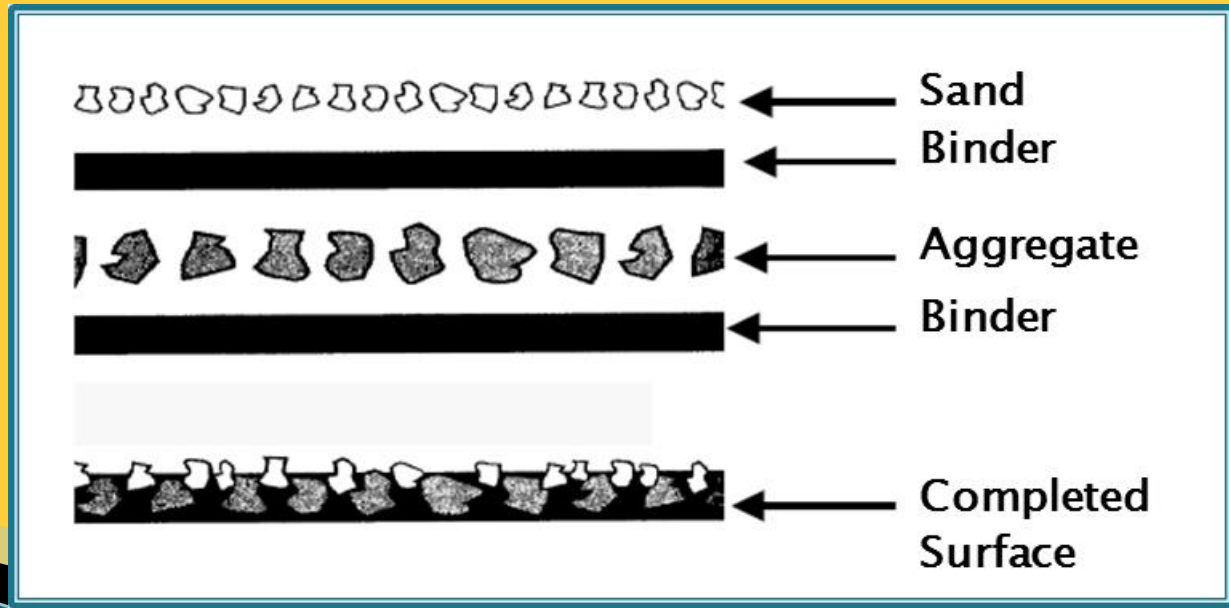
Out of the 28 Government Operated Aerodromes, only 6 have Asphalt Concrete Runways.

- **Nassau**
- **Freeport**
- **Marsh Harbour**
- **Governor's Harbour**
- **Ragged Island**
- **Mayaguana**

The majority of the aerodromes in the Commonwealth of the Bahamas uses a Pea Rock & Sand Seal treatment for their runway surfaces.

Typical Pea Rock & Sand Seal Treatment in The Bahamas

1) **A Binder is sprayed onto the limestone base compacted at 98% Modified Proctor**
2) **The limestone aggregate (3/8”) is applied to the Binder and allowed to cure for 2 days. (This step may be repeated with 5/8”).**
3) **Another coat of binder is applied to the surface, then a layer of sand is applied and rolled.**
4) **The sand layer is allowed to cure for 2 days and then the excess sand is swept away.**



Pea Rock & Sand Seal as a Viable Solution

Pea Rock & Sand Seal treatment for Pavement Surfaces in the Movement area is a viable Solution for the challenges face in The Bahamas.

- **Geologically The Bahamas is entirely made up of limestone, and limestone aggregate can be produced in abundance. In addition, marine sand is also in abundance. Therefore these raw materials are locally available on every island. No need to import granite.**
- **The cost associated with mobilization of equipment is significantly reduced (No need to transport an asphalt plant to the Family Islands).**

Pea Rock & Sand Seal on Norman's Cay

Norman's Cay is a Private Aerodrome in the Exuma Chain.

The Project included a 5,300ft/1,615m Runway reconstruction and Apron Improvement.

The Pea Rock & Sand Seal Application:
2 layers of aggregate & 1 layer of sand

Total Cost for the Pea Rock & Sand Seal surface improvements on Norman's Cay:
$3.5 Million Dollars

Estimated Cost for Asphalt Concrete surface on Norman's Cay:
$5.0 Million Dollars

Overall cost to construct a Pea Rock & Sand Seal surface versus asphalt concrete surface is 30% cheaper, $1.5 Million Dollars, which allow necessary financial resources to be used in other areas of aviation.

The Treasure in Treasure Cay, Abaco

Treasure Cay Aerodrome is a Civil Aviation Operated facility on the Island of Abaco in the Bahamas

The 7,001ft/2,134m Pea Rock & Sand Seal Runway surface that is 34 years old and has had minimal maintenance issues

Treasure Cay Runway

Overview

The major challenges face by The Bahamas as an island nation with aerodrome pavement maintenance are: the availability of necessary raw materials, mobility throughout the Family Islands coupled with and the high demand for aviation traffic. However, through use and over time we have proven that:

- **The performance of the Pea Rock & Sand Seal runways using locally available limestone and sand is equivalent to that of the asphalt concrete surfaces using imported granite**
- **The Pea Rock & Sand Seal runway surfaces displayed minimal distress over time, and therefore is lower in maintenance cost**
- **The cost for mobilizing equipment and procuring raw material for construction is lower by 30% on average as compared to asphalt concrete**
- **Cost saving from Pea Rock & Sand Seal surfaces can redirect financial resources to others critical areas to meet the increasing demand on aviation in The Commonwealth of the Bahamas.**

¡Muchas Gracias!