

## SPECIAL REPORT

# Synthetic Turf for Airfield Groundcover

AGAT Groundcover Designed for Airports

Airports: A Crisis of Capacity

Airports Turn Their Attention to Artificial Turf

The Long Road: How Artificial Turf is Cracking  
the Aviation Industry

The Pros and Cons of Artificial Turf



Sponsored by



Published by Global Business Media



Global Business  
Media





NO FOD



NO EROSION



HIGH VISUAL RECOGNITION



NO GRASS CUTTING



ARFF RESPONSE SAFE



NUDGING



NO BIRD HABITAT



DRAINAGE CONTROL



WILDLIFE MANAGEMENT



NOISE REDUCTION



## Contents

<b>Foreword</b> <i>Tom Cropper, Editor</i>	2
<b>AGAT Groundcover Designed for Airports</b> <i>Mads Lauritzen, Special Projects Liaison</i> Airport Upgrade AGAT Applications AGAT Runway Evergreen Helipad	3
<b>Airports: A Crisis of Capacity</b> <i>Tom Cropper, Editor</i> A Booming Future The Challenge for Runway Condition	7
<b>Airports Turn Their Attention to Artificial Turf</b> <i>Jo Roth, Staff Writer</i> Artificial Surfaces Gaining Acceptance	9
<b>The Long Road: How Artificial Turf is Cracking the Aviation Industry</b> <i>James Butler, Staff Writer</i> A Long and Winding Road Regulatory Approval Financial Considerations	11
<b>The Pros and Cons of Artificial Turf</b> <i>Tom Cropper, Editor</i> Jet Blasts and Foreign Object Debris The Threat of Wildlife Maintaining Aesthetics Scaling Up Aircraft Challenges to Artificial Turf	13
<b>References</b>	15

### SPECIAL REPORT

#### Synthetic Turf for Airfield Groundcover

AGAT Groundcover Designed for Airports  
Airports: A Crisis of Capacity  
Airports Turn Their Attention to Artificial Turf  
The Long Road: How Artificial Turf is Cracking the Aviation Industry  
The Pros and Cons of Artificial Turf



#### Published by Global Business Media

Global Business Media Limited  
62 The Street Ashted Surrey KT21 1AT  
United Kingdom

Switchboard: +44 (0)1737 850 939  
Fax: +44 (0)1737 851 952  
Email: [info@globalbusinessmedia.org](mailto:info@globalbusinessmedia.org)  
Website: [www.globalbusinessmedia.org](http://www.globalbusinessmedia.org)

Publisher

**Kevin Bell**

Business Development Director  
**Marie-Anne Brooks**

Editor

**Tom Cropper**

Senior Project Manager  
**Steve Banks**

Advertising Executives

**Michael McCarthy**

**Abigail Coombes**

Production Manager

**Paul Davies**

For further information visit:  
[www.globalbusinessmedia.org](http://www.globalbusinessmedia.org)

The opinions and views expressed in the editorial content in this publication are those of the authors alone and do not necessarily represent the views of any organisation with which they may be associated.

Material in advertisements and promotional features may be considered to represent the views of the advertisers and promoters. The views and opinions expressed in this publication do not necessarily express the views of the Publishers or the Editor. While every care has been taken in the preparation of this publication, neither the Publishers nor the Editor are responsible for such opinions and views or for any inaccuracies in the articles.

© 2019. The entire contents of this publication are protected by copyright. Full details are available from the Publishers. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical photocopying, recording or otherwise, without the prior permission of the copyright owner.



# Foreword

**B**ack in the 80s, growing up as a young football fan, everyone knew about Luton Town and their plastic pitch. It looked horrible and the ball did funny things. Nobody wanted to go there. That has been the impression of synthetic pitches ever since – a poor plastic impersonation of the real thing, good for sports grounds, but not much else. Today's technology, though, is very different indeed.

It looks and behaves much like the real thing. As well as sports grounds, many people are using them as a low maintenance replacement for their garden lawns. Now, though, manufacturers have a new market in their sights: aviation.

Our opening article comes from one of the world's leading producers of synthetic turf. Evergreen Aviation have developed a form of turf specifically designed for airports. They explain how it works and why they think this could be the future.

We will then look at the challenges facing airports. Increased traffic demands will place a greater strain on capacity, money is tight and competition is fierce. Synthetic turfs could be an affordable way to overcome these problems.

Even so, as Jo Roth discovers, persuading people within the industry has been quite a challenge for manufacturers. Conservatism reigns and, in a world in which budgets are limited, technology which is new and untried can struggle to make its ground.

However, with London City Airport becoming the first in Europe to trial synthetic turf, progress is coming. James Butler looks more closely at the airport's experience with the turf and what this could mean for the future.

Finally, we'll weigh up the possible uses of synthetic turf. We'll look at some of those challenges that we outlined at the beginning of this Report and see how artificial surfaces can provide the answer. The challenges are considerable and it will take innovation, imagination and a little courage to meet them.

**Tom Cropper**  
Editor

*Tom Cropper has produced articles and reports on various aspects of global business over the past 15 years. He has also worked as a copywriter for some of the largest corporations in the world, including ING, KPMG and the World Wildlife Fund.*

# AGAT Groundcover Designed for Airports

*Mads Lauritzen, Special Projects Liaison*

**Evergreen Aviation future proofs airports worldwide with Aviation Grade Artificial Turf – AGAT**

**A**GAT IS a synthetic turf designed for airports, landing strips and helipads.

With our experience within artificial turf, aviation and civil engineering, we are able to offer the possibility of optimizing security, increasing efficiency and environmental improvements, while minimizing operation costs. Our sustainable surface solutions are thoroughly tested in laboratories and airports all over the world.

The Danish-based company Evergreen Aviation has made the first installation of artificial turf in a European civil airport.

The special artificial turf from Evergreen Aviation is named Aviation Grade Artificial Turf (AGAT) and is an innovative form of groundcover.

AGAT is sustainable, easy to maintain and has a proven ability to reduce and prevent jet blast erosion and wildlife.

Evergreen Aviation provides consultancy, installation, service, operation and maintenance of AGAT.

## AGAT's Safety Effect

- FOD Foreign Object Debris – secures against creation and improves visual identification of FOD
- Erosion – closes the surface and secures it against erosion
- Visual Recognition – independency of seasons and clear visual recognition
- Incursions – minimized maintenance and reduction of the need for ground personnel airside
- ARFF – response increases the access and shortens the rescue turnout
- Nudging – signaling which affects behavior unconsciously but effectively
- Bird Strikes – reduces food and hiding places for birds and therefore reduces their presence
- Drainage – increases the possibility of surface drainage
- Wildlife – management environment neutral and not lethal, removal of food, shelter, water for birds and prey

- Noise Reduction - AGAT works as a noise reduction in Aprons, Taxiways and Helipads

## AGAT Applications

- A380 – Airport Upgrade
- Edges of Maneuvering Areas
- Fuel Stations
- ILS Areas
- Intersections
- Islands
- Lamps
- PAPI
- Runway (RWY)
- Runway Markings
- Security Fence
- Service Areas
- Service Roads
- Shoulders
- Signs
- Evergreen Helipad

Evergreen Aviation provides safety and efficiency to Airports worldwide through a large number of different applications. The specific applications needed to increase safety and optimize operation time and maintenance, are different from airport to airport. Through close collaboration and counseling with Evergreen Aviation the most advantageous solutions are found for each specific airport.

## Airport Upgrade

To operate the Airbus 380 and similar large aircraft, airports have to comply with the Class F requirements. By means of AGAT, airport category can be upgraded from class E to F. AGAT allows for overall wider TWY and RWY without increasing the fortified area, and at the same time the visual reference is increased and FOD clearly detectable.

Shoulders on RWY and TWY can be made wider without increasing the fortified area causing stagnant water on the runway after downpours. It is possible to construct rainwater storage in the base building to control delay



**Aviation Grade Artificial Turf**  
Groundcover designed for Airports



**FOD**  
Foreign Object Debris  
Secures against creation, improves visual identification of FOD



**Erosion**  
Closes the surface and secures it against erosion



**Visual Recognition**  
Independency of seasons and clear visual recognition



**Incursions**  
Minimized maintenance, reduction of the need for ground personnel airside



**ARFF Response**  
Increases the access and shortens the rescue turnout



**Nudging**  
Signaling which affects behavior unconsciously but effectively



**Bird Strikes**  
Reduces food and hiding places for birds and therefore reduces their presence



**Drainage**  
Increases the possibility of surface drainage



**Wildlife Management**  
Environment neutral and not lethal, removal of food, shelter, water for birds/prey



**Noise Reduction**  
Aviation Grade Artificial Turf works as a noise reduction in Aprons, Taxiways and Helipads

[www.EvergreenAviation.dk](http://www.EvergreenAviation.dk)



*Evergreen Aviation provides safety and efficiency to Airports worldwide through a large number of different applications*



of surface water for derivation, reducing the pressure on the drainage system.

Shoulders paved with AGAT will eliminate erosion and optimize the visual reference of the RWY without compromising safety.

AGAT is tested for jet blast and for supporting ultra-heavy loads, including large aircrafts, and for supporting emergency response equipment. AGAT meets ASTM installation requirements.

AGAT is compliant with FAA Advisory Circular 150/5370-15B, and has been identified as a material that can be used to cover large portions of airport property with multiple benefits, such as providing consistent groundcover, as well as reducing maintenance costs and attractive vegetative food sources for hazardous wildlife species.

Synthetic turf technology has passed over 30 independent lab tests including tunnel, jet wash, load veering, slip resistance adhesive, ASTM, fire retardant and tear strength. Synthetic AGAT for airport ground cover is crucial for the overall success of airport operational safety.

AGAT can last 15+ years of wear and tear from jet blast and natural causes (projected up to 35+ years for UV alone).

### AGAT Applications

AGAT is a highly recommended solution to ensure the right conditions around the various airport

ground signal devices. Airport lamps are extremely vulnerable to plants. It is of utmost importance that all airport marking equipment is kept free of any disturbance that may interfere with its functionality.

Installation of AGAT in combination with existing equipment is trouble-free.

AGAT creates a sharp contrast that increases visibility. AGAT is easy to align and is adaptable to individual specification designs, airfield requirements and modification needs.

Installing AGAT at intersections and islands gives a clear visual reference to the runway limits and secures against aircraft leaving runways at barred exits. A strong base covered with AGAT provides a maximal load-bearing capacity, strong enough for heavy vehicles to run over without sinking in and even for aircraft that cut corners accidentally with the inner wheel.

Cost-benefit analyses, evaluating the construction expenditures against increased safety, increased esthetics, and reduced operating expenses, are among AGAT's many advantages.

The artificial turf solves water-pooling problems and controls erosion. On AGAT, rain and other fluids are collected and lead to the drain. Sand infill in AGAT absorbs spills of fuel, oil etc. and contaminated infill can easily be replaced. The sand infill works as a fire retardant in case of ignited spills on the ground.



AGAT's fire resistance rated 'excellent' when tested in cooperation with the Airside Facilities Engineering Team at the Greater Toronto Airports Authority.

One of the key areas to be used so far has been jet blast areas around the edges of runways. At London Southend Airport, for example, they were struggling with erosion at the end of Runway 05. They quickly settled on AGAT as being the perfect option as Marc Taylor who oversaw the project's completion says.

"Our advisors at Burroughs recommended the AGAT solution to restore and future proof the jet blast area. We contacted Evergreen Aviation and met with special project liaison Mads Lauritzen, who flew in for an inspection and a very informative conversation about the civil works required. Working in collaboration with Evergreen Aviation, we identified the appropriate construction method to accommodate the AGAT safely. The artificial grass solution makes a lot of sense, being effective, affordable and has multiple advantages."

First the airport laid a well-prepared subbase made by civil contractor JKS Group to ensure the installation went as planned. From there they were able to complete the laying of AGAT overnight with minimal disruption.

"By using AGAT, we can help these issues and provide solutions that are cost beneficial, safe,

and long lasting," said Evergreen Aviation's special projects liaison Mads Lauritzen who led the installation team. "In this case, we installed from the end of the runway pavement across the main jet blast area and above the approach-bar concrete foundations, preventing foreign object damage (FOD) from eroding natural soil and minimising hazards when cutting grass around the approach lights."

### AGAT Runway

A runway paved with AGAT gives the ideal surface to land small and medium size aircraft regardless of geographical and weather conditions.

Visual recognition of surface, lines and markers regardless of weather.

FOD elimination and recognition to ensure maximum safety during taxi, warm up, start, landing, hot start and engine braking.

Immediate usage and instant repair.

Snow removable, with documented friction in dry and wet conditions

Fire retardant, chemical resistant, flood proven, surface with documented friction on the entire surface, lines and edges in all weather conditions.

Markings will be permanent and with same friction and will have distinct color difference regardless of natural light level and humidity. AGAT can be installed as runway surface for jets, propeller and hang gliders.

## Aviation Grade Artificial Turf

Groundcover designed for Airports

- NO FOD**  
**FOD**  
 Foreign Object Debris  
 Secures against creation, improves visual identification of FOD
- Erosion**  
 Closes the surface and secures it against erosion
- Visual Recognition**  
 Independency of seasons and clear visual recognition
- Incursions**  
 Minimized maintenance, reduction of the need for ground personnel airside
- ARFF Response**  
 Increases the access and shortens the rescue turnout
- Nudging**  
 Signaling which affects behavior unconsciously but effectively
- Bird Strikes**  
 Reduces food and hiding places for birds and therefore reduces their presence
- Drainage**  
 Increases the possibility of surface drainage
- Wildlife Management**  
 Environment neutral and not lethal, removal of food, shelter, water for birds/prey
- Noise Reduction**  
 Aviation Grade Artificial Turf works as a noise reduction in Aprons, Taxiways and Helipads

[www.EvergreenAviation.dk](http://www.EvergreenAviation.dk)



*AGAT is tested for jet blast and for supporting ultra-heavy loads, including large aircrafts, and for supporting emergency response equipment*

By landing on AGAT instead of natural grass, hazardous divots and soft spots, which typically occur in touch down and taxi areas, are prevented. The even surface has a documented positive effect of the life expectancy of gear and fuselage. AGAT and infill are environmentally neutral and, as such, can be used in sensitive areas.

Clear airfield markings are important – both for air and ground personnel. AGAT markings can improve visual reference in various ways and appeal to those who give the airport industry safety the most concern. AGAT allows markings to be embedded right into the turf.

### Evergreen Helipad

#### Advantages of the Helipad

- No FOD and debris: Fast and safer start, stop, loading and unloading
- Ideal visual reference: Safe straight approach and recognition of foreign objects
- Fueling: AGAT provides safest possible surface when fueling
- No maintenance: Permanent markings and absorption of small particles
- Snow clearing: No limits of snow removability, without the use of chemicals

The Evergreen helipad is sized to accommodate the largest helicopter in regular use. The Annex 14 determines the helipad size and markings. If local restriction dictates smaller sizes, consideration must be made by organizers and planners.

AGAT is installed on a sub base. The sub base takes into account the maximum load to be borne by the helipad in a worst-case scenario. It is typically not the weight of the helicopter, but service vehicles such as fire trucks, snow removal gear, fuel trucks, load and unload gear that determines the maximum load bearing on



the helipad. Once the sub base is put in place, the AGAT is rolled out.

AGAT is often installed on a sub base with an underestimated load bearing, since it is easily repaired. Note that the surface will not break up or create FOD in case of a sub base collapse.

The standard color of AGAT is green. Permanent markings are white for landing, yellow for taxi and red for service vehicles access, in accordance to Annex 14. Normally the green turf is installed first, and then the markings are cut in on site. If local conditions require it, the entire AGAT surface can be produced off location and airlifted to its final destination.

### Contact

**Name:** Evergreen Aviation ApS  
**Address:** Kokkedal Industripark 2A, 2980 Kokkedal, Denmark  
**Phone:** +45 39 29 99 99  
**Website:** [www.evergreenaviation.dk](http://www.evergreenaviation.dk)  
**Email:** [Mads@evergreenaviation.dk](mailto:Mads@evergreenaviation.dk)

*By landing on AGAT instead of natural grass, hazardous divots and soft spots, which typically occur in touch down and taxi areas, are prevented*

# Airports: A Crisis of Capacity

Tom Cropper, Editor

The world is becoming addicted to air travel. With demand expected to double over the next 15 to 20 years, how will infrastructure cope?

IT'S JANUARY 2019 and protestors are gathering outside the High Court in London. In their sights are proposals for a third runway at Heathrow. Issues such as air and noise pollution, they say, should stand in the way of London's biggest airport's expansion plans. They are not alone. Every time an airport announces plans to expand, they spark waves of similar protests.

It will always be controversial. Expansion of an airport such as Heathrow will inevitably run into environmental and political problems. Despite assurances from the airport, it flies in the face of Government commitments to reduce dramatically carbon emissions. Already air quality around Heathrow regularly exceeds safe levels and the cost of putting it right is climbing<sup>1</sup>.

On the other hand, expansion is necessary. Demand for air travel is expected to boom over the next 20 years. The operators of Heathrow and other large hubs will have to find a way of processing all those extra numbers. If they are not allowed to build new airports or expand existing infrastructure, they are entitled to ask, what can they do?

### A Booming Future

After suffering slumps in the wake of 9/11 and the financial crisis of 2008, air travel is booming again. In 2018 passenger numbers surged by 6.5%<sup>2</sup>. IATA's long-term forecasts suggest passenger numbers could double to more than 8bn in 2037 with traffic growing at an annual rate of over 3.5%<sup>3</sup>. Most of that growth will come from rising economies such as China, India and Brazil, but numbers will be increasing across the world. Airports face an unenviable task. They will have to increase dramatically their capacities, while having limited scope for expansion. It's a case of doing much more with what they have.

That will not be easy. Over the coming decades more of the world's major hubs will be operating at, or near, full capacity for longer. According to

the European Commission, major hubs such as London Heathrow, Gatwick and Dusseldorf are already operating at full capacity. By 2030, if current trends continue, 19 key European airports could also reach saturation point<sup>4</sup>.

At the same time, they have to operate in an environment of growing economic uncertainty. Whether it's trade tensions between the US and China, the never-ending saga of Brexit or tensions in the Middle East, the global economy faces uncertainty and threats everywhere it looks. Oil prices are volatile. After the crash of 2014, in which the price of oil dipped below the \$30 mark, it is on the rise again. So too is the cost of fuel.

The aviation industry suffers also from the curious distinction of being a sector which has experienced consistently rising demand over the past decades but has seen profit margins shrink. According to Airports Council International, more than 60% of all airports are failing to turn a profit<sup>5</sup>. Only the largest and busiest hubs are making money and even they are doing so only because they have high volumes, tight control of expenditure and the ability to access non aeronautical revenue through retail outlets. For smaller regional hubs, the financial proposition looks extremely gloomy.

Airports must consider the growing expectations of customers. There was a time when people viewed air travel as something they had to endure. If they wanted to get where they were going, they had little choice other than to work with whatever experience the airport gave them. That's not the case now. We are all consumers and we have come to expect a certain standard of quality and convenience wherever we go. Most people have a choice of more than one international hub and they have shown themselves willing to make proactive choices about which airport or airline to use based on their past experience. Airports, therefore, are having to address every aspect of the flying experience in order to retain their passengers.

## Aviation Grade Artificial Turf

Groundcover designed for Airports

**NO FOD**

**FOD**

Foreign Object Debris  
Secures against creation, improves visual identification of FOD

**Erosion**

Closes the surface and secures it against erosion

**Visual Recognition**

Independency of seasons and clear visual recognition

**Incursions**

Minimized maintenance, reduction of the need for ground personnel airside

**ARFF**

**Response**

Increases the access and shortens the rescue turnout

**Nudging**

Signaling which affects behavior unconsciously but effectively

**Bird Strikes**

Reduces food and hiding places for birds and therefore reduces their presence

**Drainage**

Increases the possibility of surface drainage

**Wildlife Management**

Environment neutral and not lethal, removal of food, shelter, water for birds/prey

**Noise Reduction**

Aviation Grade Artificial Turf works as a noise reduction in Aprons, Taxiways and Helipads

[www.EvergreenAviation.dk](http://www.EvergreenAviation.dk)



*After suffering slumps in the wake of 9/11 and the financial crisis of 2008, air travel is booming again. In 2018 passenger numbers surged by 6.5% . IATA's long-term forecasts suggest passenger numbers could double to more than 8bn in 2037 with traffic growing at an annual rate of over 3.5%*



### The Challenge for Runway Condition

So how does this all relate to the conditions of the airside infrastructure? Increased capacity will put pressure on runways, taxiways and the turf. Busier runways will also exacerbate existing problems such as foreign object debris and turf erosion. This can be unsafe as well as harming the visual impact of the airport.

To cope with these demands, operators will be looking for solutions which are simple, cost effective, can improve efficiency and boost the capacity of existing infrastructure. One of these solutions comes in the form of the ground surface of airports. The existing approach relies on a mixture of hard surfaces and grassy areas, but these are prone to damage. An alternative lies in the form of synthetic turf. A number of airports have been thinking about moving to

artificial grass surfaces for many years, but momentum is now really beginning to build. US Airports started the trend and European hubs are beginning to follow suit.

Adoption is in its early stages, but manufacturers of artificial surfaces have ambitious goals. They see artificial grass providing an alternative to existing grassy areas as well as helipads and some landing strips. It is more stable, durable and reliable than natural turf, is easier to clear of snow and ice and retains its grip in all conditions. It reduces maintenance requirements, copes with heavy traffic loads and reduces the threat of FOD and wildlife issues for incoming and outgoing aircraft. All this and it looks good too! Those airports which have already used it have been highly positive in their feedback. The challenge now will be persuading operators that it represents an affordable upgrade on what they already have.

*Most people have a choice of more than one international hub and they have shown themselves willing to make proactive choices about which airport or airline to use based on their past experience*

# Airports Turn Their Attention to Artificial Turf

Jo Roth, Staff Writer

Trials around the world are showing that artificial turf can deliver a viable alternative to natural grass for the aviation sector.

WHEN THE Federal Aviation Authority inspected the airfield at JFK in 2000, it found a number of areas at the edges of runways which had become dangerously eroded and were in need of stabilization. The problem, as an investigation by the Port Authority of New Jersey discovered, was that the existing grass used by the airport operators was not up to the rigors of jet blasts<sup>6</sup>. Their solution was to provide more protection to the ground service by using synthetic turf and it worked. Other airports around the world are following suit.

In 2017, London City Airport became the first airport in Europe to trial synthetic turf with 400m<sup>2</sup> of artificial turf initially being installed in the jet blast areas of runway 27 and Taxiway M. These areas suffered from problems such as jet blasts and loose objects being thrown up due to blasts from the engines. Both were having a severe impact on the natural grass surfaces, increasing wear and creating safety issues<sup>7</sup>.

"The installation took place in an area of the airfield where the aircraft do a particular maneuver to line up on the runway. As they turn around, that particular area is exposed to high levels of jet blast which made it the ideal location for a trial" said Charles Joubely, project manager at London City Airport. "Since the installation, there have been no issues with the AGAT," he added. "Airfields are always being inspected and there have been no issues reported so far."

### Artificial Surfaces

Aviation Grade Artificial Turf (AGAT) has been specially designed to provide an artificial turf surface capable of being used for airports, landing strips and helipads. It offers low maintenance, the ability to reduce erosion by jet blast, retains the integrity of turf edges and provides a clear visual distinction between different areas of the runway. It offers good grip if an aircraft has to run off the runway and keeps wildlife and flora away from runway areas.

While most of the attention so far has been on jet blast areas, Evergreen Aviation has been keen to promote its use in three different areas:

- **Edges and maneuvering areas:** Uses have so far focused on edges and maneuvering areas. This is useful in areas with high load bearing demands such as high-volume traffic traverse zones. It maintains its condition without causing rutting or erosion to the edges which might be seen with grassy areas. It will also provide good grip if an aircraft has to run off a runway and onto the verge. It offers better visual distinction between areas in all weather conditions and is promoted as a significant safety improvement compared to grass.
- **Runways:** AGAT can be used as a good surface for landing strips designed to cope with small aircraft. It maintains its condition better than grass and makes it easier to identify foreign object debris. It can be used instantly and offers clear recognition of surface lines and markers regardless of the conditions. It maintains friction in wet and dry conditions and also maintains performance after snow removal.
- **Helipads:** The bright clear artificial grass provides good markings in all weather conditions and maintains its condition for longer without maintenance. It reduces foreign object debris which leads to faster and safer landing, loading and take off. In winter conditions it has unlimited snow clearance capacity without the need for chemicals and is also safe to use for refueling operations.

### Gaining Acceptance

As things stand, Evergreen Aviation leads the pack in what is hardly a crowded field. There are only a couple of manufacturers world-wide. They see themselves as offering a solution to many of the challenges airports will face in the future. Even so, as they admit, it has been a long and tough road to convince the aviation sector.

"I've been trying to sell artificial turf throughout Europe and other parts of the world for eight years.

## Aviation Grade Artificial Turf

Groundcover designed for Airports

**FOD**  
Foreign Object Debris  
Secures against creation, improves visual identification of FOD

**Erosion**  
Closes the surface and secures it against erosion

**Visual Recognition**  
Independency of seasons and clear visual recognition

**Incursions**  
Minimized maintenance, reduction of the need for ground personnel airside

**ARFF Response**  
Increases the access and shortens the rescue turnout

**Nudging**  
Signaling which affects behavior unconsciously but effectively

**Bird Strikes**  
Reduces food and hiding places for birds and therefore reduces their presence

**Drainage**  
Increases the possibility of surface drainage

**Wildlife Management**  
Environment neutral and not lethal, removal of food, shelter, water for birds/prey

**Noise Reduction**  
Aviation Grade Artificial Turf works as a noise reduction in Aprons, Taxiways and Helipads

[www.EvergreenAviation.dk](http://www.EvergreenAviation.dk)



*As things stand, Evergreen Aviation leads the pack in what is hardly a crowded field. There are only a couple of manufacturers world-wide. They see themselves as offering a solution to many of the challenges airports will face in the future*



However it has proven to be extremely difficult to promote new standards to the aviation authorities” Nikolaj Duckert, Technical Director at Evergreen Aviation told CHECKin.dk.

The company had been attempting to sell the artificial turf to airports around Europe, including Denmark, but it wasn't until London City Airport picked up the phone that they had enjoyed much success. Synthetic turf requires fresh thinking. It is a material which is little understood and takes a step forward from the traditional approach, which is to use grass. Whether it's a lack of familiarity with the technology or a naturally conservative desire to control costs, many operators are reluctant to make the leap.

The project at London City Airport, though, is demonstrating that artificial turf can offer answers to many of the most serious questions being asked by airports such as how to reduce maintenance costs, combat jet blast erosion and

foreign object debris and how to improve safety.

So far results have been promising and London City airports hopes to invest in artificial turf in all grass areas, totaling 160,000 square meters.

“The airport has not had any challenges with the artificial turf, even though it has had heavy rain. An area of 400 square meters is too small to have any impact on bird strikes, but if artificial turf replaces all natural grass, we will remove the presence of mice, rats, geese and other birds. The airport expects to reduce bird strikes by 16 to 32 percent,” adds Nikolaj Duckert.

This is a new technology and, like many innovations, will run into resistance from those who will be naturally suspicious of change. Money is tight and new solutions will always have to prove their value. The penalties for getting things wrong can be severe. However, as the experience at London City Airport and others shows, it is meeting every challenge put in front of it.

*“An area of 400 square meters is too small to have any impact on bird strikes, but if artificial turf replaces all natural grass, we will remove the presence of mice, rats, geese and other birds. The airport expects to reduce bird strikes by 16 to 32 percent”*

**Nikolaj Duckert, Technical Director, Evergreen Aviation**

## The Long Road: How Artificial Turf is Cracking the Aviation Industry

**James Butler, Staff Writer**

In a bid to improve safety and save money, airport operators are increasingly turning to artificial turf solutions. accurate visualization and faster warnings.

FOR MOST people artificial turf is seen as something for sports fields or people who want to keep their gardens looking nice in dry climates. However, manufacturers are now producing synthetic turf solutions aimed at airports. Those who have used it generally report positive outcomes. Results suggest it can reduce maintenance costs, combat erosion and cope with jet blasts and foreign object debris.

### A Long and Winding Road

Manufacturers have faced a long and, at times, tough journey in convincing airport operators and regulators of the value of artificial turf. Like anything which is new, it has to work hard to prove its effectiveness.

Back in 2006, a study in the US examined the effectiveness and safety of artificial turf for use with runways. It was commissioned as a number of airports began looking into its use to address issues such as erosion, damage and maintenance. The study worked with producers of artificial turfs and airports, and looked at those airports in which it had already been used, including:

- Chicago O'Hare International Airport
- Chicago Midway International Airport
- Boston Logan International Airport
- Detroit Metropolitan Wayne County Airport
- Honolulu International Airport
- San Francisco International Airport
- Ocean City Municipal Airport.

It also carried out safety tests at the Federal Aviation Administration William J. Hughes Technical Center specifically focusing on jet blast erosion.

According to the Report, artificial turf can be effective in a number of ways including reducing soil erosion, combating foreign object debris, reducing wildlife incursions and improving the visual impact of the airport.

“The two main reasons for the use of artificial turf installations were to control soil erosion and to mitigate foreign object debris issues,” states the Report. “Other considerations for the use of artificial turf included lower turf maintenance, wildlife mitigation, and visual enhancements. The majority of airport concerns focused on the ability to resist jet blast, weather effects and contaminants (fuel, deicing fluids, hydraulic fluids), and to support the load of safety vehicles as well as being skid and fire-resistant.”

It also found airports which were especially at risk of flooding were turning to artificial turf as a way of maintaining ground conditions during times of high rain. Ocean City Municipal Airport, for example, was located on a bay and, during heavy rain, experienced problems with water pooling and soil erosion. High tides might also see water spill over onto the runway causing erosion to the soil between the runway and taxiways.

The Report found that those airports which had trialed the use of synthetic turf were reportedly satisfied with its performance. They also said that they were happy with its cost effectiveness, although there was relatively little data available.

In general, the report was positive, but did acknowledge that there was limited data available to make assertions about its long-term value. Product specification tests were also incomplete and additional tests and standards needed to be applied.

### Regulatory Approval

Part of the problem is that aviation authorities are playing catchup. The FAA did not have any standards aimed at artificial turf, but that changed quickly. As part of this study, existing FAA standards were reviewed to assess their applicability for artificial turf applications.

The FAA's own investigations into the use of artificial turf led to an advisory circular that found that it could be used “as an alternate to natural

### Aviation Grade Artificial Turf

Groundcover designed for Airports

- FOD**  
Foreign Object Debris  
Secures against creation, improves visual identification of FOD
- Erosion**  
Closes the surface and secures it against erosion
- Visual Recognition**  
Independency of seasons and clear visual recognition
- Incursions**  
Minimized maintenance, reduction of the need for ground personnel airside
- ARFF Response**  
Increases the access and shortens the rescue turnout
- Nudging**  
Signaling which affects behavior unconsciously but effectively
- Bird Strikes**  
Reduces food and hiding places for birds and therefore reduces their presence
- Drainage**  
Increases the possibility of surface drainage
- Wildlife Management**  
Environment neutral and not lethal, removal of food, shelter, water for birds/prey
- Noise Reduction**  
Aviation Grade Artificial Turf works as a noise reduction in Aprons, Taxiways and Helipads

[www.EvergreenAviation.dk](http://www.EvergreenAviation.dk)



*Back in 2006, a study in the US examined the effectiveness and safety of artificial turf for use with runways. It was commissioned as a number of airports began looking into its use to address issues such as erosion, damage and maintenance*



turf or other surface treatments used to stabilize shoulders and safety areas. An additional use is to install these systems on paved areas not intended for aircraft movement<sup>9</sup>."

It should be designed and installed so it will not be displaced by jet blasts and anchor pull tests should be used to check its reliability. It must also be placed on a surface capable of supporting the heaviest jets. Surface deformations in excess of three inches or that allow shoving or wrinkles in the material will require immediate inspection and repair.

It must have good drainage resistant properties ensuring water does not accumulate. Heavy rain conditions must not flush infill material from the surface and all artificial turf surfaces must provide storm run-off capabilities similar to paved surfaces. Before installation, the surface will have to undergo extensive testing for its runoff drainage coefficient in accordance with ASTM F 1551.

Guidance from the regulators is crucial. It adds legitimacy, provides reassurance and offers details about how artificial turf solutions can be introduced effectively into the airport environment. Even so, operators will still need to show a clear return on investment for adoption to approve.

### Financial Considerations

Finances are tight at airports of all sizes around the world and installing synthetic turf represents a significant upfront investment. Technology has evolved dramatically; synthetic turf is a highly sophisticated material designed to the highest specifications in order to withstand the rigors of aviation use. This does not come cheap. To win over any doubters, producers will have to demonstrate that their solutions will deliver a clear financial return on investment.

Their argument revolves around reductions in ongoing maintenance. Because synthetic turf retains its integrity, surfaces will stay solid for longer. Fewer interventions will also require lower staff costs. It's a strong argument and the more airports choose to adopt synthetic turf the greater the body of evidence supporting its use.

This is happening. Several airports in the USA have already made the move and are reporting positive results. European airports such as London City are also making the move and their experience is showing that these solutions can be effective, affordable and deliver a good return on investment. Where they lead, others follow which means the aviation sector will continue to represent an extremely promising market for producers of artificial turf. The move from the football field to the airport is well and truly underway.

*Artificial turf can be effective in a number of ways including reducing soil erosion, combating foreign object debris, reducing wildlife incursions and improving the visual impact of the airport*

## The Pros and Cons of Artificial Turf

Tom Cropper, Editor

Airport operators are seriously looking at the possibility of using artificial turf for ground areas. But how effective can it be and what areas would be most suitable?

ARTIFICIAL TURF is being presented as a sustainable and affordable alternative to natural grass, but the industry is still uncertain about whether it can truly help it meet the challenges of the future. Questions remain about its cost effectiveness and in which situations it should be used. In this article, we will look at some of the challenges confronting the industry, how these may change in the future and what a move to synthetic turf may deliver in terms of a return on investment.

### Jet Blasts and Foreign Object Debris

Jet blasts have long been a problem for airports. Their design constantly has to cater to the risks blasts pose to surfaces and other infrastructure. Grass surfaces struggle to cope. This is one of the most common reasons why airports around the world are switching to artificial surfaces for runway safety areas, shoulders and ramps. So long as they are installed correctly, they can withstand the pressures of blasts without eroding.

Similarly, they make it easier to identify foreign object debris (FOD), another serious problem for aircraft. As traffic increases, identifying debris is becoming an increasingly common problem. Because artificial turf does not erode to the same extent as grass and maintains its visual integrity, FOD accumulation is less likely and objects are much more easily identified.

### The Threat of Wildlife

Bird strikes represent one of the most serious hazards to aircraft. 2018 was a particularly bad year. According to the FAA, US operators experienced an average of 40 bird strikes per day. In total US airlines reported 14,661 collisions over the course of the year. With traffic at airports likely to become much busier in coming decades, this risk is likely to keep growing<sup>10</sup>.

The most common choice for land cover at airports has predominantly been turfgrass. However, depending on the type of grass used, it can create a wildlife hazard. A USDA report

warns that if grass is attractive to wildlife it could "increase the potential for wildlife aircraft collisions if planted near critical airport operating areas<sup>11</sup>."

The traditional approach to wildlife management, said the report, such as discing, prescribed burning and planting food plots, benefits wildlife by providing food, cover and other resources. Instead, it argued, airports should make a greater effort to ensure high operating areas keep wildlife away.

Authorities around the world have recognized the need for effective wildlife management. Some have laid down specific rules while others offer looser guidelines. Many of these look at the length of the grass. In the UK, authorities specify that grass should be maintained at between six and eight inches to reduce the attractiveness to wildlife while maintaining the overall aesthetic appeal.

Switching to artificial turf would create large areas close to operational zones which have no appeal to wildlife. It creates an exclusion zone in areas where aircraft will be passing regularly and reduces the risk of collisions with wildlife.

### Maintaining Aesthetics

Grass surfaces may be problematic, but even so they are still valued for their aesthetic appeal. An airport represents a gateway into its country which makes it important to maintain an impressive visual impact. Grass areas and vegetation play an important part in that process. Unfortunately, the rigors of daily airport operations mean keeping the areas looking their best is an ongoing job.

Grass areas are susceptible to rutting from the passage of vehicles and damage from jet blasts. Unless their condition is managed, they can quickly become unsightly. Replacing turfgrass with synthetic grass gives the airport a much more consistent look. Modern artificial turf manages to deliver a much more natural and realistically grass-like finish. At the same time it brings an increased resistance to jet blasts and other causes of wear, which reduces the need for ground crews to constantly maintain ground conditions.

**AGAT**

**Aviation Grade Artificial Turf**  
Groundcover designed for Airports

- NO FOD**  
Foreign Object Debris  
Secures against creation, improves visual identification of FOD
- Erosion**  
Closes the surface and secures it against erosion
- Visual Recognition**  
Independency of seasons and clear visual recognition
- Incursions**  
Minimized maintenance, reduction of the need for ground personnel airside
- ARFF Response**  
Increases the access and shortens the rescue turnout
- Nudging**  
Signaling which affects behavior unconsciously but effectively
- Bird Strikes**  
Reduces food and hiding places for birds and therefore reduces their presence
- Drainage**  
Increases the possibility of surface drainage
- Wildlife Management**  
Environment neutral and not lethal, removal of food, shelter, water for birds/prey
- Noise Reduction**  
Aviation Grade Artificial Turf works as a noise reduction in Aprons, Taxiways and Helipads

[www.EvergreenAviation.dk](http://www.EvergreenAviation.dk)



*With air traffic predicted to double over the next couple of years thanks, in part, to a spike of air travel from China, the size of aircraft is rising. Heathrow recently passed the 200-seat mark but barely makes it into the top 30*



### Scaling Up Aircraft

With air traffic predicted to double over the next couple of years thanks, in part, to a spike of air travel from China, the size of aircraft is rising. Heathrow recently passed the 200-seat mark but barely makes it into the top 30<sup>12</sup>. Innovata / Diio Mi schedule data shows a clear rise in the average size of aircraft over a ten-year period. The arrival of the Airbus 380 took aviation towards a new era of scale and luxury. This double decker behemoth appeared to be the future of air travel with the ability to carry up to 800 passengers. However, the economics of fueling and operating this four-engine monster meant Airbus struggled to make it economically viable. In February 2019 they announced that they would be ending production after Emirates decided to drop an order<sup>13</sup>.

Even so, this is an icon of the aviation world and is extremely popular with passengers. The main factors against it have been the cost of running it and the fact that not all airports are able to carry it. So, although new orders are drying up, being able to handle aircraft of such scale will give airports an advantage. Manufacturers of artificial turf, meanwhile, say their turf makes it easy for airports to switch from Category E to F required to take the Airbus.

Equally, synthetic turf can make it easier to cope with a world in which operators are switching their focus from super carriers to smaller two engine aircraft. The Airbus 380 was designed to help airlines carry more people with fewer flights. If it has reached the end of the road, airports will need to increase the number of flights. In itself, this will put pressure on infrastructure and push operators

towards solutions which reduce interruptions to the smooth flow of airside operations. Any time taken out for maintenance will stand in the way of attempts to increase the number of slots available. The big hope for artificial turf then, is that it can withstand heavy traffic levels and will have lower maintenance requirements.

### Challenges to Artificial Turf

The market for artificial turf at airports is only just beginning to gather momentum and there are many things which stand in the way. Some may not like the appearance of artificial grass. For most, it's a natural inertia standing in the way of innovation. They are accustomed to natural turf. The prospect of covering thousands of square metres with artificial turf will represent a significant upfront cost. In a fiscally conservative environment, many operators will be reluctant to make that leap unless they feel comfortable about the return on investment. Some may decide to make the transition gradually, spreading out the cost and seeing how the new surface performs at every stage.

Those looking to sell the benefits of artificial ground surfaces to the aviation industry, until recently, have struggled with the unfamiliar nature of the technology. It's easy to show benefits in theory but without real life case studies, convincing operators to make a purchase can be a challenge. With airports beginning to trial new surfaces that is changing. A growing body of evidence is mounting which demonstrates how artificial surfaces can play a vital role in helping airports face the considerable challenges of the coming decades.

## References:

- <sup>1</sup> Heathrow Air Quality Costs Two to Three Times Higher Than Thought: <https://www.aef.org.uk/2018/03/07/heathrow-air-quality-costs-two-to-four-times-higher-than-previously-thought-says-minister/>
- <sup>2</sup> Healthy Passenger Demand Continues in 2018: <https://www.iata.org/pressroom/pr/Pages/2019-02-07-01.aspx>
- <sup>3</sup> IATA Forecasts Predicts 8.2 Billion Passengers: <https://www.iata.org/pressroom/pr/Pages/2018-10-24-02.aspx>
- <sup>4</sup> Europe's Airports in 2030: [http://europa.eu/rapid/press-release\\_MEMO-11-857\\_en.htm](http://europa.eu/rapid/press-release_MEMO-11-857_en.htm)
- <sup>5</sup> 66% of the World's Airports are Losing Money: <https://www.portcalls.com/66-worlds-airports-losing-moneyreport/#>
- <sup>6</sup> JFK Turns to Astroturf: <https://airportimprovement.com/article/jfk-tests-artificial-turf-countering-erosion-fod>
- <sup>7</sup> London Based Airport Installs Danish Astroturf: <https://evergreenaviation.dk/a-london-based-airport-installs-danish-artificial-turf/>
- <sup>8</sup> Airside Applications for Astroturf: <http://www.tc.faa.gov/its/worldpac/techrpt/ar06-23.pdf>
- <sup>9</sup> FAA advisory circular: [https://www.faa.gov/documentlibrary/media/advisory\\_circular/150\\_5370\\_15b.pdf](https://www.faa.gov/documentlibrary/media/advisory_circular/150_5370_15b.pdf)
- <sup>10</sup> Planes Strike Bird More than 40 Times Per Day: <https://eu.usatoday.com/story/news/nation/2019/02/06/bird-strikes-airplanes-wildlife-federal-aviation-administration-data-sully-sullenberger/2613893002/>
- <sup>11</sup> Managing Turfgrass to Reduce Wildlife Hazards: [https://www.aphis.usda.gov/wildlife\\_damage/nwrc/publications/13pubs/washburn134.pdf](https://www.aphis.usda.gov/wildlife_damage/nwrc/publications/13pubs/washburn134.pdf)
- <sup>12</sup> Aircraft Size is Growing at Europe's Busiest Hubs: <https://www.anna.aero/2014/02/05/aircraft-size-is-growing-at-europes-busiest-airports/>
- <sup>13</sup> The World's Biggest Passenger Plane, the Airbus 380 is Dead. Here's What Killed it: <http://time.com/5529439/airbus-a380-retired/>



Notes:

# Evergreen Aviation

## Best Aviation Grade Artificial Turf in the World...!



**NO FOD**



**NO EROSION**



**HIGH VISUAL RECOGNITION**



**NO GRASS CUTTING**



**ARFF RESPONSE SAFE**



**NUDGING**



**NO BIRD HABITAT**



**DRAINAGE CONTROL**



**WILDLIFE MANAGEMENT**



**NOISE REDUCTION**



**EvergreenAviation.dk +45 3929 9999**



# Airport Technology Reports

The leading specialist online research and networking resource for Senior Professionals in the Airport Industry



- Up to the minute news and other content available to all site users on a free-of-charge, open access basis.
- Qualified signed up members are able to access premium content Special Reports and interact with their peers using a variety of advanced online networking tools.
- Designed to help users identify new solutions, understand the implications of different choices and select the best options available.
- Thought Leadership – Advice and guidance from internationally recognised key opinion leaders in the airport industry.
- Peer Input – Contributions from senior airport industry professionals.
- Independent Editorial Content – Expert and authoritative analysis from award winning journalists and leading industry commentators.
- Unbiased Supplier Provided Content.
- Designed to facilitate debate.
- Written to the highest professional standards.