The Use of Avian Radar to help Mitigate Bird-Aircraft Strike Risk at Istanbul New Airport, Turkey

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Co-Authors:

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Mrs. Ulku Ozeren, Mr. Tansu Tuncali, Mehmet Eren Yalman, Sercan Bilgin (IGA/Istanbul New Airport)
Mr. Andy Baxter – Birdstrike Management Limited
• The Istanbul New Airport (INA) is the largest airport built from scratch and poised to open as a global hub in Turkey later this year.
• Avian radar has been used as a key tool to help provide the bird situational awareness needed to mitigate the risk of bird strikes, both in the pre-construction and post-construction phases.
• Lying at the intersection of two key migratory routes on the southern coast of the Black Sea, INA faces typical bird hazards found at other large airports, and other risks specific to their airport.
• This case study reports on the use of avian radar pre-construction, the planned use post-construction, and the continued use during planned airport expansion phases leading to an annual passenger capacity of 150 million passengers a year.
• Airport location, design and proximity to a key migratory flyway
• Pre-construction assessment of bird hazards to guide risk mitigation efforts
• Collaborative partnership with stakeholders involved in bird strike risk mitigation
• Avian radar use during initial construction to establish a pre-operation baseline
• Use of avian radar information during initial operations
• Use of avian radar information during airport expansion phase
• Discussion
Istanbul New Airport Location

**41°15’39.97”N, 28°44’32.54”E**

*Will replace Atatürk Airport*

(Courtesy of Wikipedia)

Istanbul New Airport (İstanbul Yeni Havalimani)

<table>
<thead>
<tr>
<th>Summary</th>
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<tbody>
<tr>
<td><strong>IATA:</strong> IST · <strong>ICAO:</strong> LTFM[1]</td>
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<table>
<thead>
<tr>
<th>Airport type</th>
<th>Public</th>
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<tbody>
<tr>
<td><strong>Owner</strong></td>
<td>General Directorate of State Airports (DHMI)</td>
</tr>
<tr>
<td><strong>Operator</strong></td>
<td>IGA (İstanbul Grand Airport) Havalimani İşletmesi A.Ş.</td>
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<td><strong>Serves</strong></td>
<td>Istanbul, Turkey</td>
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<tr>
<td><strong>Location</strong></td>
<td>Arnavutköy, Istanbul</td>
</tr>
<tr>
<td><strong>Opened</strong></td>
<td>29 October 2018 (expected)</td>
</tr>
<tr>
<td><strong>Time zone</strong></td>
<td>TRT (UTC+03:00)</td>
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<tr>
<td><strong>Coordinates</strong></td>
<td>41°15’39.97”N 28°44’32.54”E</td>
</tr>
<tr>
<td><strong>Website</strong></td>
<td><a href="http://www.igairport.com">www.igairport.com</a></td>
</tr>
</tbody>
</table>
Airport Location, Design & Migratory Flyways

Istanbul New Airport Design

First Phase/Initial Construction

<table>
<thead>
<tr>
<th>Direction</th>
<th>Length (ft)</th>
<th>Length (m)</th>
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<tbody>
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<td>3,750</td>
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</table>

www.igairport.com
Airport Location, Design & Migratory Flyways

Istanbul New Airport Design

www.igairport.com
Istanbul New Airport Design

www.igairport.com
Migratory Flyways over Istanbul New Airport

- ~5 million birds migrate over Istanbul annually
- Daytime, soaring birds are most dangerous to aircraft
- Spring migration ~4 times more dense than autumn migration
Pre-Construction Bird Hazard Assessment

Two Distinctive Classes of Bird Hazards

**Large Airport Mixed Wildlife Environment**
- Gulls, European Starlings, Feral Pigeons, mix of corvids, storks, raptors, swallows and swifts
- Birds take advantage of airport habitats
- Terminal and infrastructure works try to minimize attractants
- Risk is expected to be similar to other large international airports

**Unique to INA**

**Major Migratory Flyway**
- Airport positioned on a major migratory flyway
- Hundreds of thousands of individuals of large flocking species
- White/Black Storks, eagles, buzzards, hawks pass directly over aerodrome at altitudes that can conflict with aircraft
- Risk associated with birds that cross the aerodrome during the day irrespective of habitat
Pre-Construction Bird Hazard Assessment

Visual Observations at INA

*Buteo buteo* Common Buzzard – Sercan Bilgin

*Clanga pomarina* Lesser Spotted Eagle – Tansu Tuncali

*Ciconia ciconia* White Stork

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Pre-Construction Bird Hazard Assessment

Autumn 2017 Visual Observations of Soaring Migratory Birds (2015-16 similar)

Majority of daytime movements follow a SE heading
Pre-Construction Bird Hazard Assessment

Spring 2018 Visual Observations of Soaring Migratory Birds (2015-17 similar)

Majority of daytime movements follow a NW heading.

The management advantage is these movements are predictable, accounting for weather, wind and season.
White Stork Migration Spring & Autumn (Resource: movebank.org)

Daytime movements are almost all traveling on a SE heading
Pre-Construction Bird Hazard Assessment

Spring 2014, 2015, 2016: Tracks from Tagged Lesser Spotted Eagles

https://satellite-telemetry.jimdo.com/
http://birdmap.5dvision.ee/EN
Pre-Construction Bird Hazard Assessment

Autumn 2014, 2015, 2016: Tracks from Tagged Lesser Spotted Eagles

https://satellite-telemetry.jimdo.com/
http://birdmap.5dvision.ee/EN
Collaborative Partnership with Stakeholders

The Migratory Flyway Bird Strike Risk Requires Cooperation to Mitigate

- Stakeholders: INA, DHMI, ATC, Pilots
  - INA=Airport   DHMI=Air Navigation Service Provider
  - DHMI AoR: 500’-2000’ AGL, to 13km
  - INA AoR: 0-500’ AGL

- Normal bird awareness & control strategies as expected at any large international airport will be implemented throughout the year
- Need to predict NW (spring) & SE (fall) daytime, migratory movements of large flocks through departure and arrival corridors
- Method 1: Harass birds to turn them away or move them further out
  (real-time avian radar alerting to mobile wildlife control team)
- Method 2: Delay departures to allow flocks to pass
  (real-time avian radar alerting to ATC who advise pilots)
- Method 3: NOTAM, ATIS messages [1]
Avian Radar Use During Initial Construction

Accipiter® NM1-24D/F24D Avian Radar

- Two co-located 3D, X-band 25kW radars 500 m west of middle of Runway 1
- One radar with fixed dish antenna aligned on arrival/departure corridors (F24D)
- One radar with agile dish (24D) that scans elevation angles of interest [2]
Avian Radar Use During Initial Construction

Establish Baseline Bird Activity

Daytime Heading Distribution

Nighttime Track Counts

Daytime Track Counts

Count

Data
Establish Baseline Bird Activity

daytime activity only shown here
Avian Radar Use During Initial Construction

Nighttime Spring Migration

- Migrating birds cover the entire airspace
- 11 March 2018, 8-9 pm local

[Map showing bird migration patterns]

[Histogram showing track size in dBsm for Agile and Fixed modes]
Avian Radar Use During Initial Construction

Daytime Autumn Migration

• Migrating birds cross the aerodrome during the day
• 27 October 2017, 1-2 pm local

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Avian Radar Use During Initial Construction

Daytime Autumn Migration

- Migrating birds cross the aerodrome during the day
- 29 October 2017, 9-10 am local
Avian Radar Use During Initial Construction

Daytime Autumn Migration

- Migrating birds cross the aerodrome during the day
- 18 November 2017, 9-10 am local
Avian Radar Use During Initial Construction

Daytime Commuter Traffic in Late Autumn

- Commuter traffic crosses main runways
- ATIS message and ATC advising pilots

4-5 pm local
11 Nov 2017
24 Nov 2017
06 Dec 2017
Avian Radar Use During Initial Operations

Tactical & Strategic Surveillance-to-Intelligence™ (S2I) Tools

- Data from all radars integrated into single tactical tool
- At INA: Fixed radar feed, Agile radar feed
- ADS-B feed (anticipated)
- Browser based accessible from anywhere
- Wildlife control team on mobile tablets (anticipated)
- Airside operations
- ATC
- Daily, weekly, monthly and annual interactive reports to characterize bird activity
Avian Radar Use During Airport Expansion Phase

Integrated, airport-wide radar network

- All avian radar feeds integrate into the single Accipiter® Radar Common Operating Picture (COP)
- Alerting & Reporting (Daily, Weekly, Monthly, Annual) based on data collected with an integrated avian radar network, distributed throughout the airfield

Additional avian radar(s) plug and play as airport expands
Avian radar has a key role to play at every stage of airport development

- **During Pre-construction**
  - Hazard assessment
  - Develop risk mitigation strategies

- **During Construction**
  - Hazard assessment / baseline bird activity
  - Select risk mitigation methods
  - Deploy/test real-time alerting to threats from radar
  - Standard Operating Procedures (SoPs) / Training

- **During Operation**
  - Update bird activity data and compare to previous
  - Execute SoPs / monitor effectiveness / tune

_New runways (expansion) would use avian radar in a similar pre-construction, construction, and post construction manner._