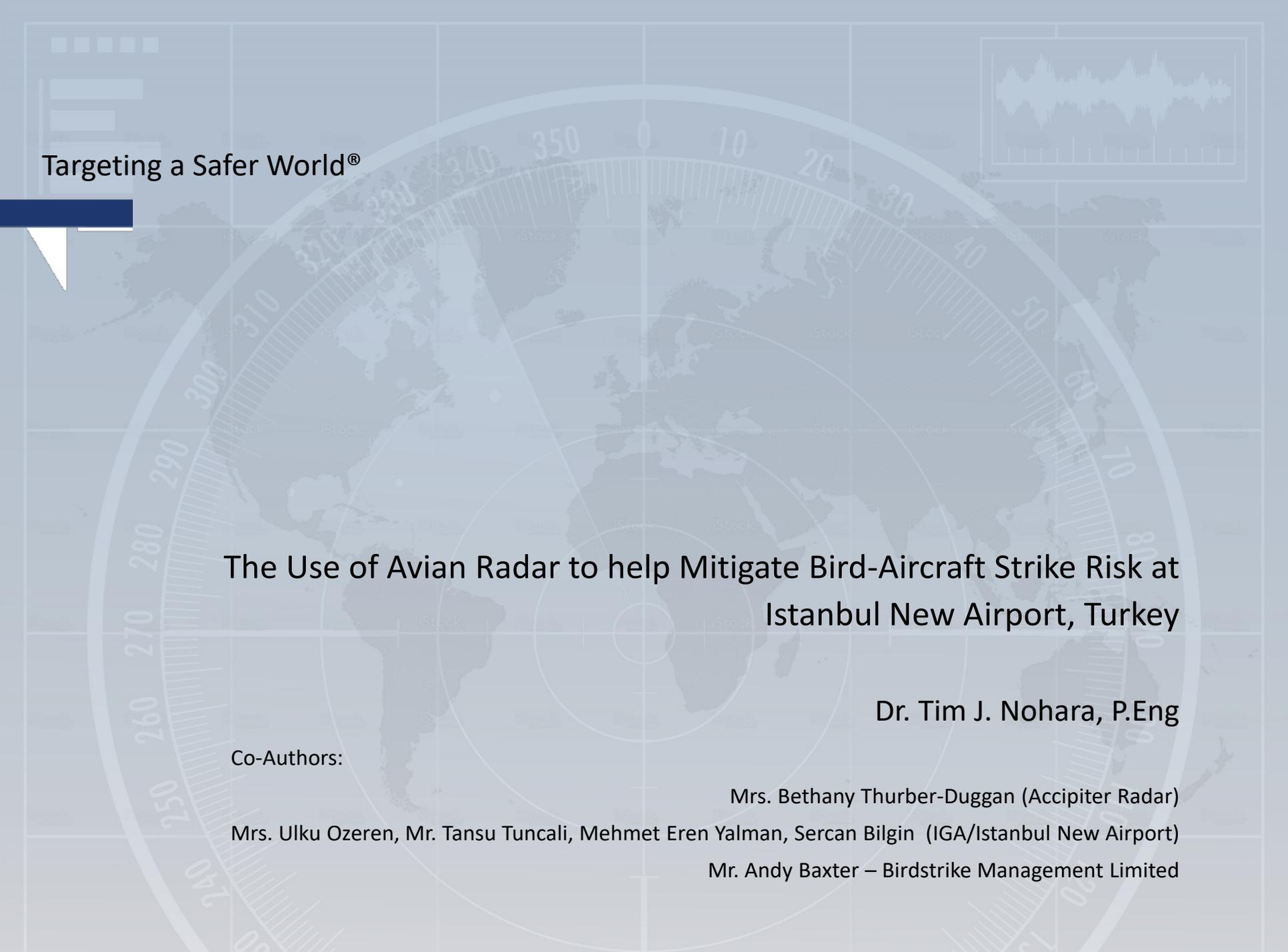




Targeting a Safer World®



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

Dr. Tim J. Nohara, P.Eng

Co-Authors:

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Mrs. Bethany Thurber-Duggan (Accipiter Radar)

Mr. Andy Baxter – Birdstrike Management Limited

Istanbul New Airport

The opportunity to use avian radar information in the original safety design of a major hub airport. Avian radar used pre-construction & post-construction.

- 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 Havalimanı*)

IATA: IST · ICAO: LTFM^[1]

Summary

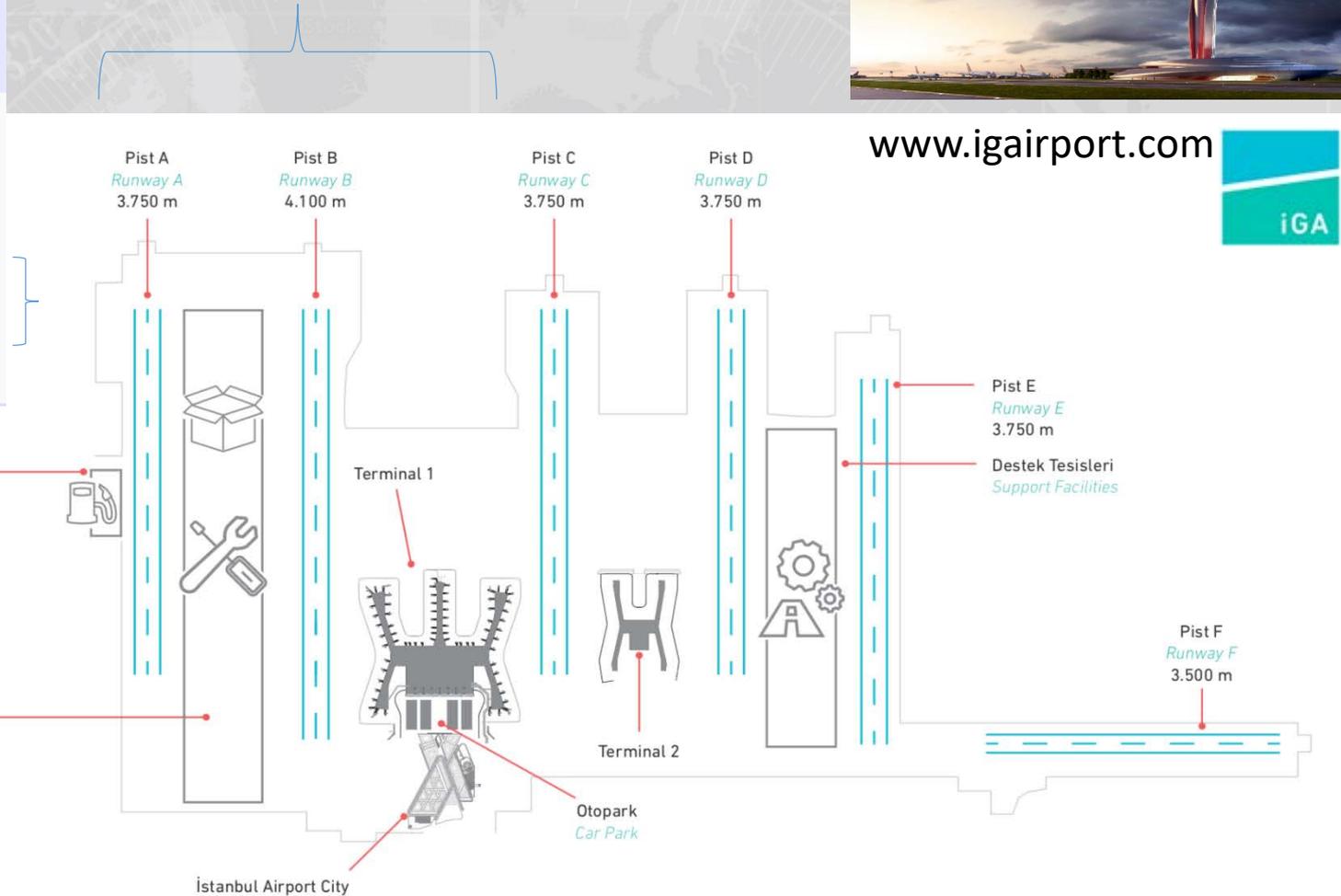
Airport type	Public
Owner	General Directorate of State Airports (DHMI)
Operator	IGA (Istanbul Grand Airport) Havalimanı İşletmesi A.Ş.
Serves	Istanbul, Turkey
Location	Arnavutköy, Istanbul
Opened	29 October 2018 (expected)
Time zone	TRT (UTC+03:00)
Coordinates	 41°15'39.97"N 28°44'32.54"E
Website	www.igairport.com 

Istanbul New Airport Design



First Phase/Initial Construction

Direction	Runways	
	Length	
	ft	m
16L/34R	12,303	3,750
17R/35L	12,303	3,750
18L/36R	12,303	3,750
18C/36C	13,451	4,100
18R/36L	12,303	3,750
09/27 ^[2]	9,483	3,000



www.igairport.com



Istanbul New Airport Design

www.igairport.com



Istanbul New Airport Design

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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

Two Distinctive Classes of Bird Hazards

Unique to INA



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

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

Visual Observations at INA



Buteo buteo Common Buzzard – Sercan Bilgin



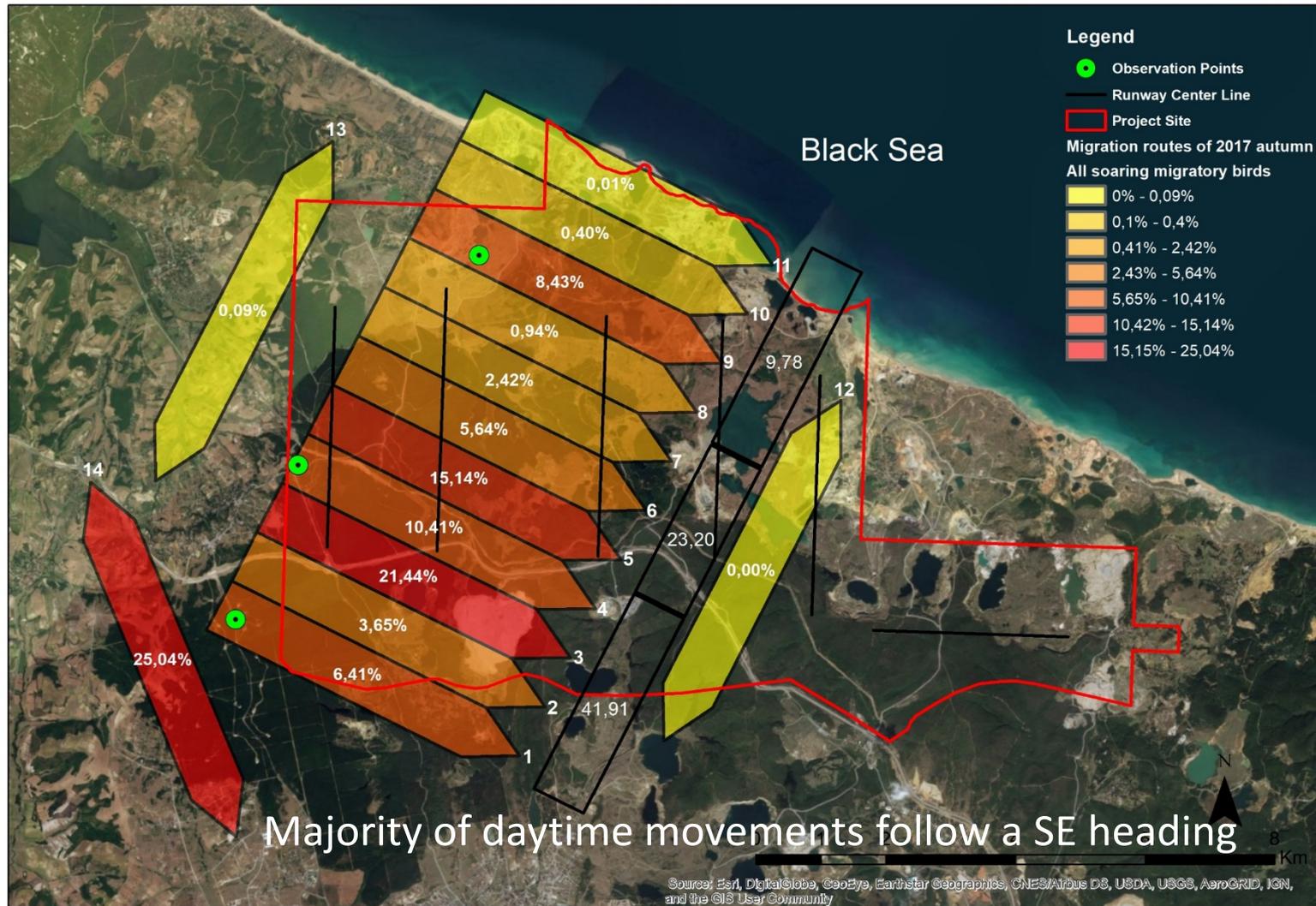
Clanga pomarina Lesser Spotted Eagle – Tansu Tuncali



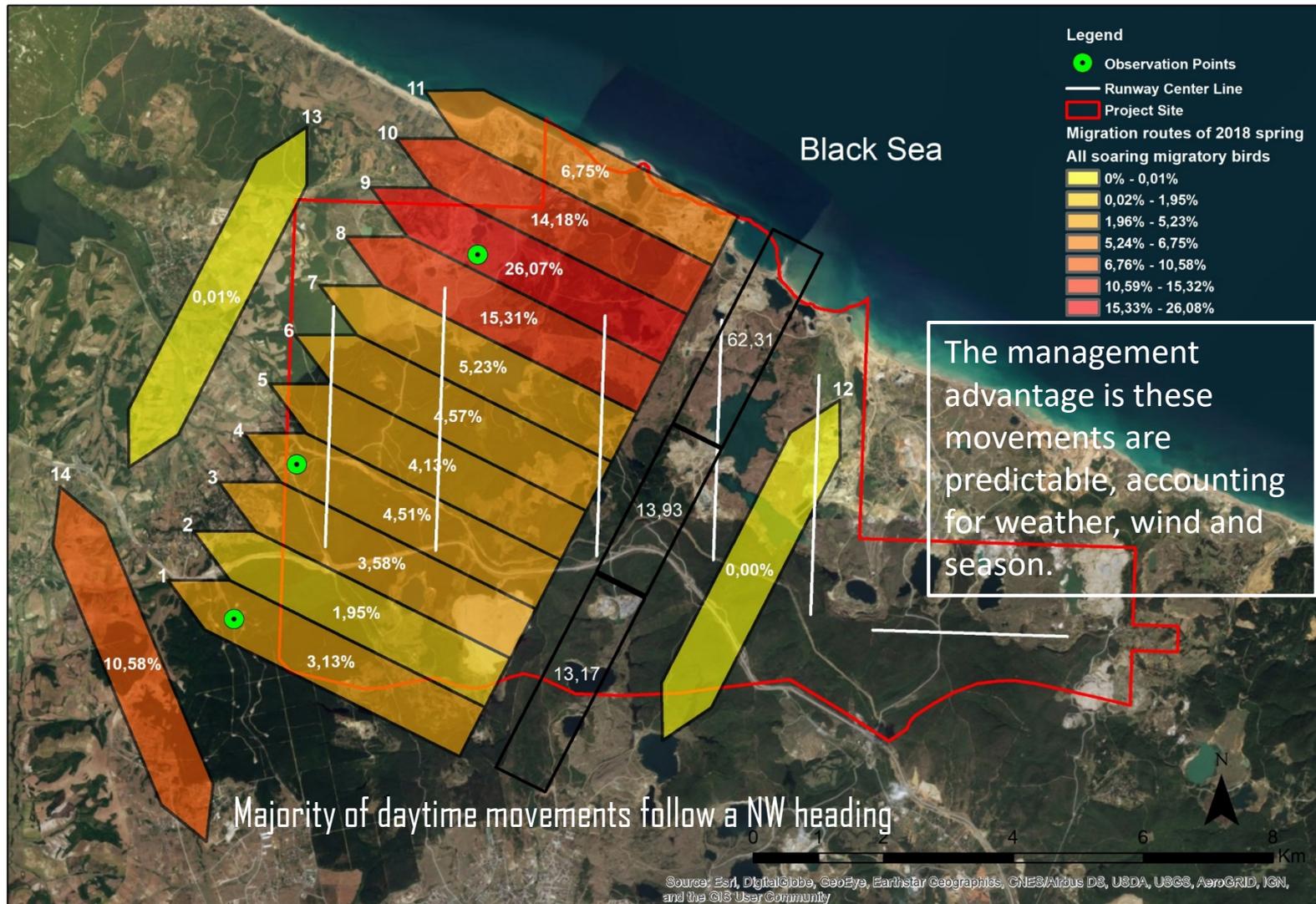
Ciconia ciconia White Stork

Ciconia ciconia Leyelek . Tansu Tuncali

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



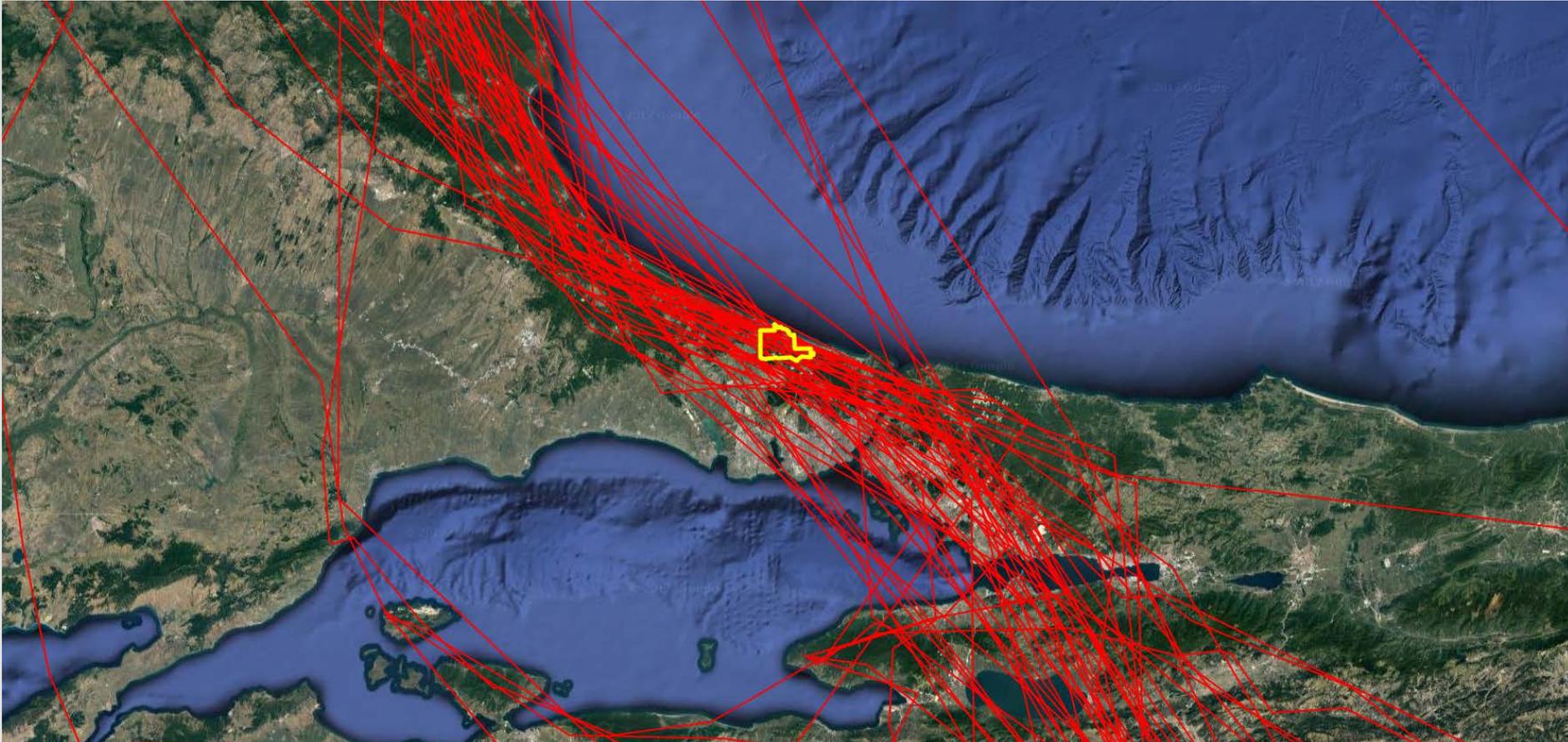
Spring 2018 Visual Observations of Soaring Migratory Birds (2015-17 similar)



White Stork Migration Spring & Autumn (Resource: movebank.org)

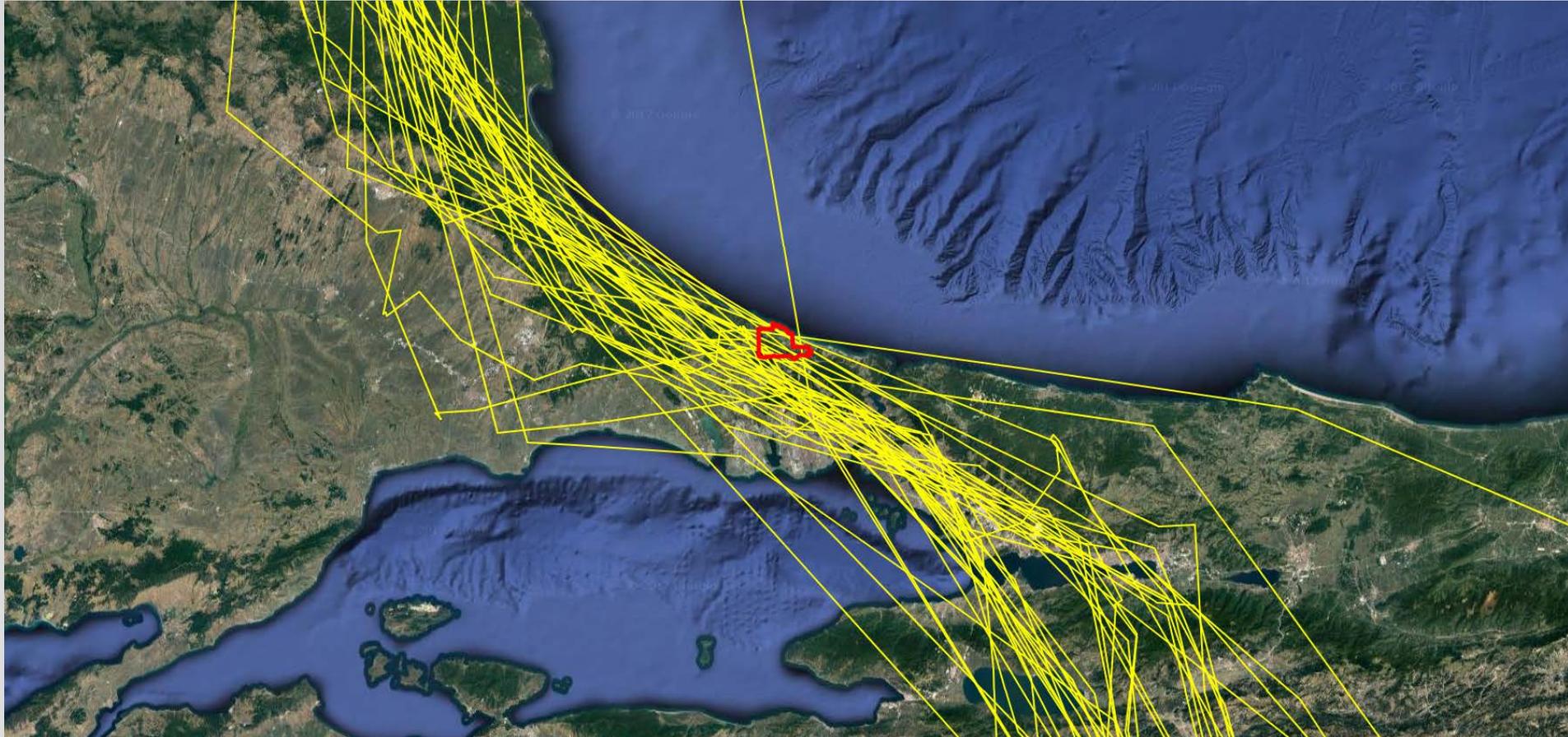


Spring 2014, 2015, 2016: Tracks from Tagged Lesser Spotted Eagles



<https://satellite-telemetry.jimdo.com/>
<http://birdmap.5dvision.ee/EN>

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



<https://satellite-telemetry.jimdo.com/>

<http://birdmap.5dvision.ee/EN>

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]

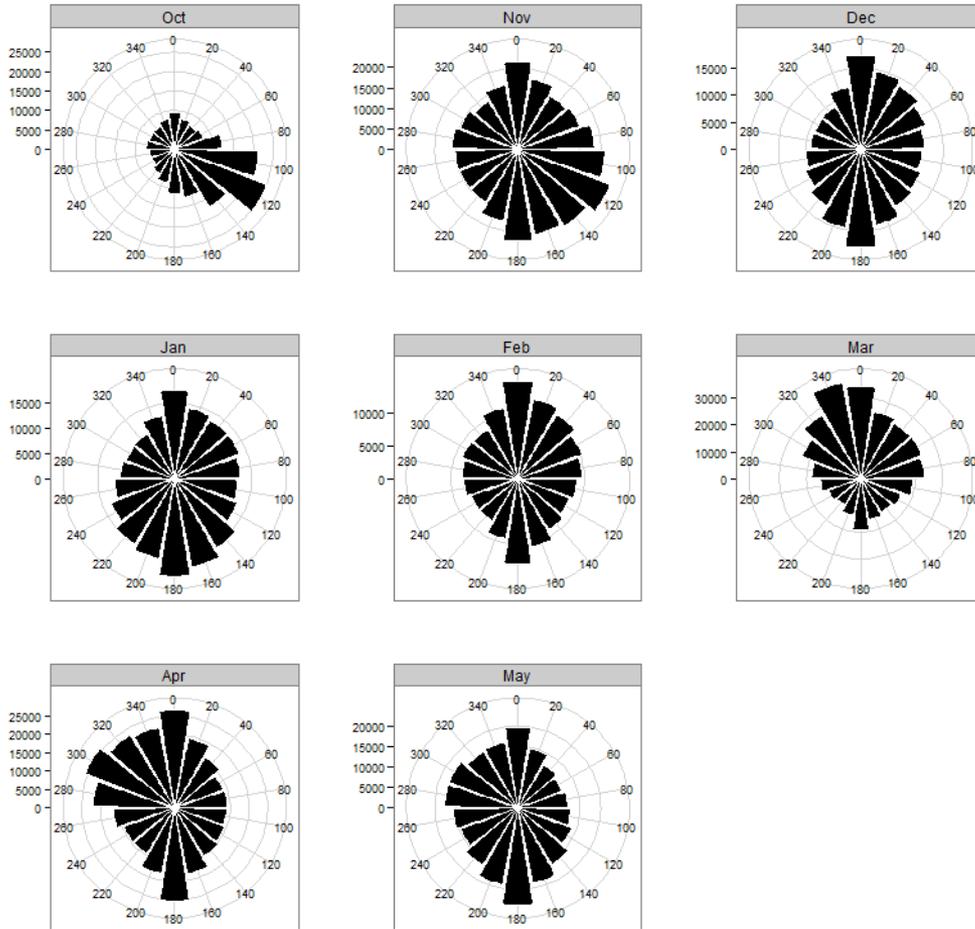
Accipiter® NM1-24D/F24D Avian Radar

- 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]

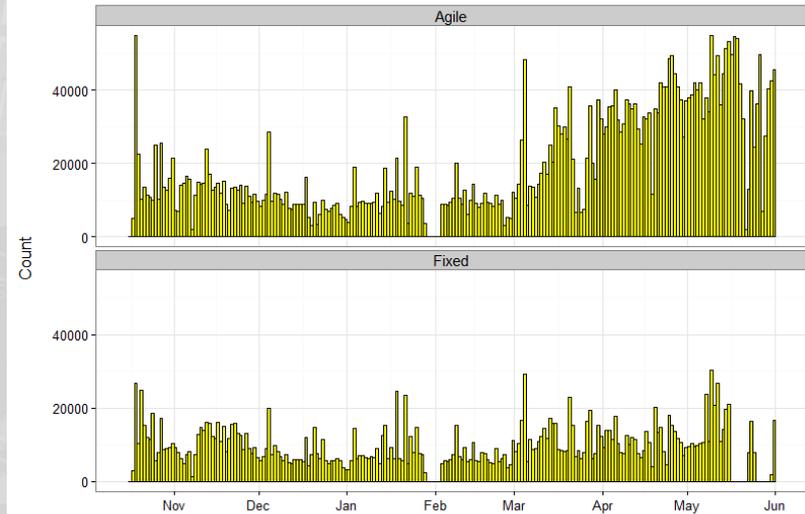


Establish Baseline Bird Activity

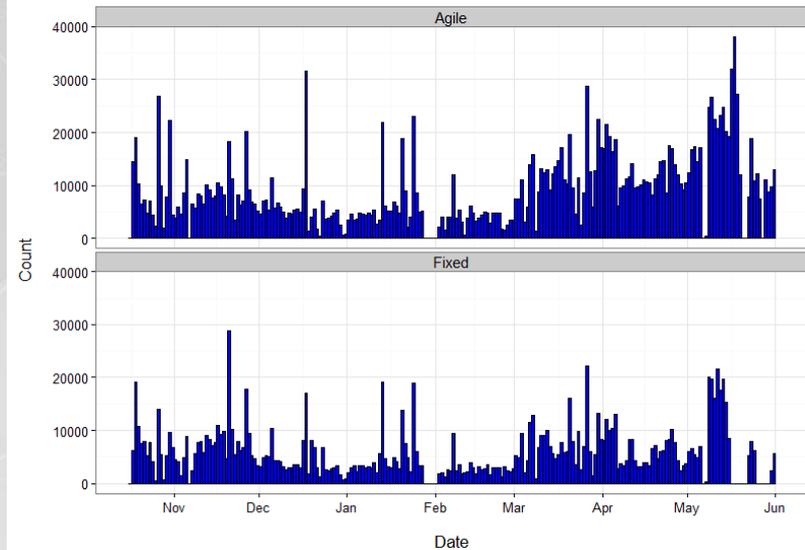
Daytime Heading Distribution



Daytime Track Counts

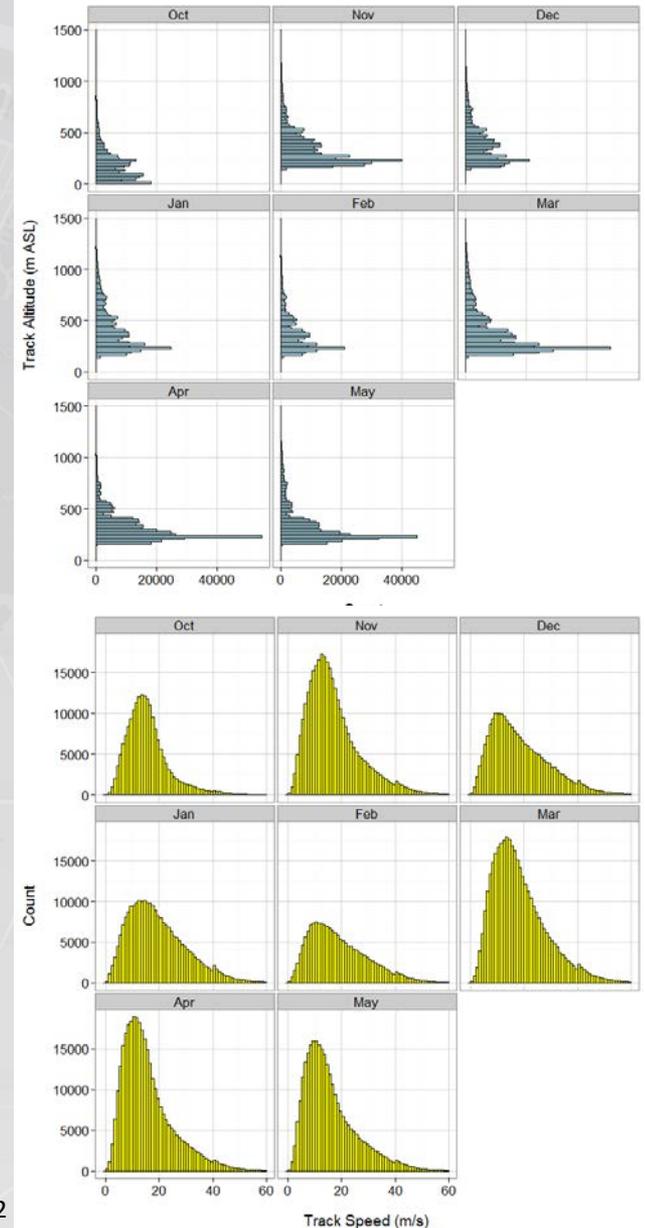
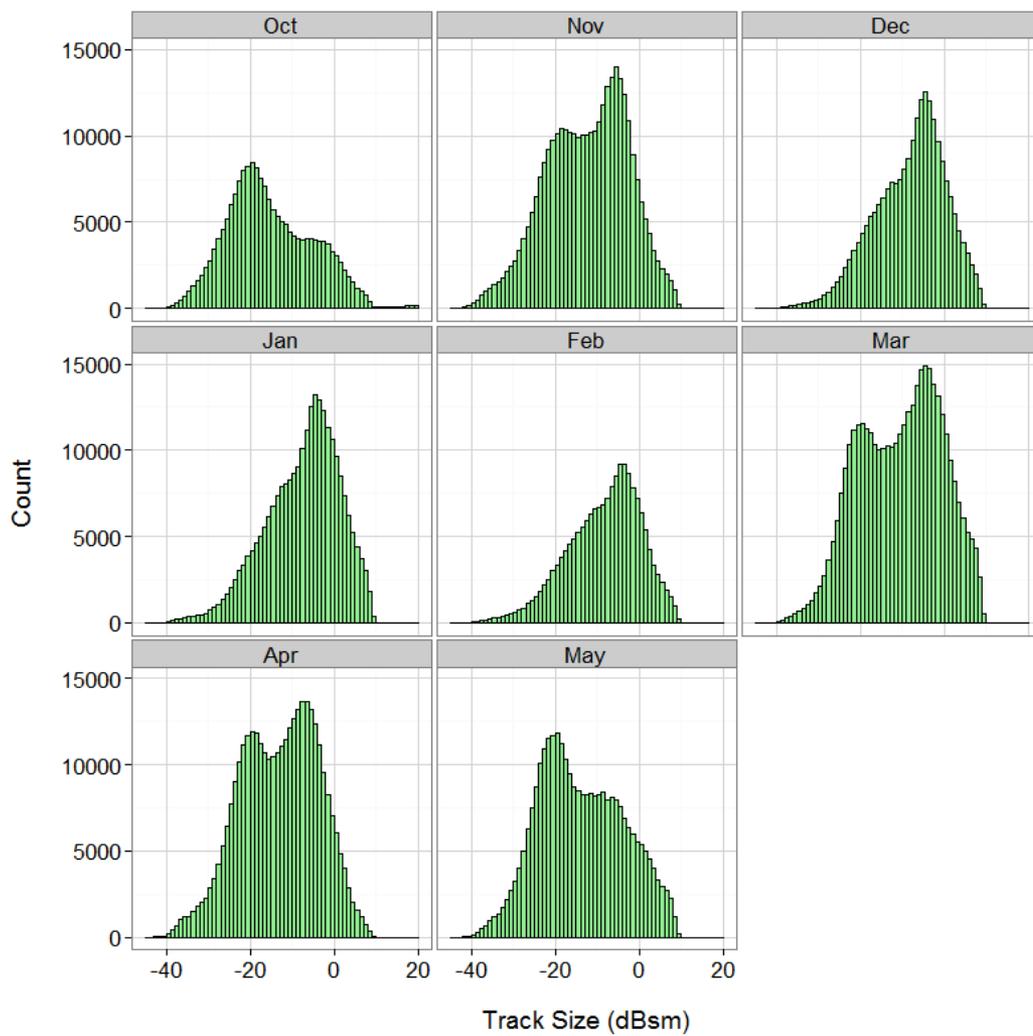


Nighttime Track Counts



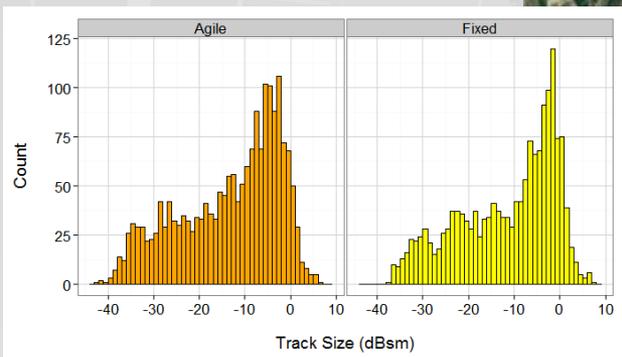
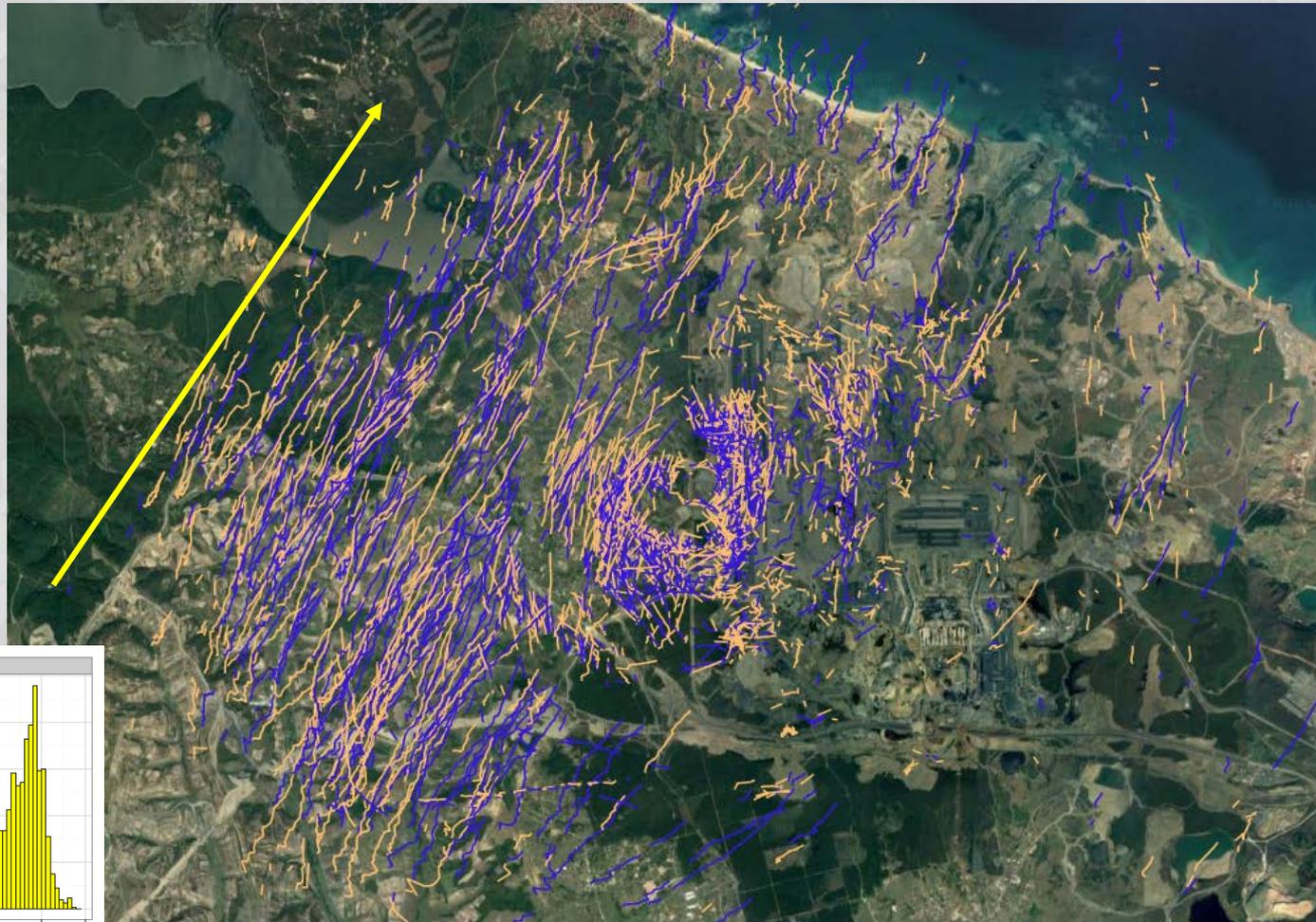
Establish Baseline Bird Activity

daytime activity only shown here



Nighttime Spring Migration

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

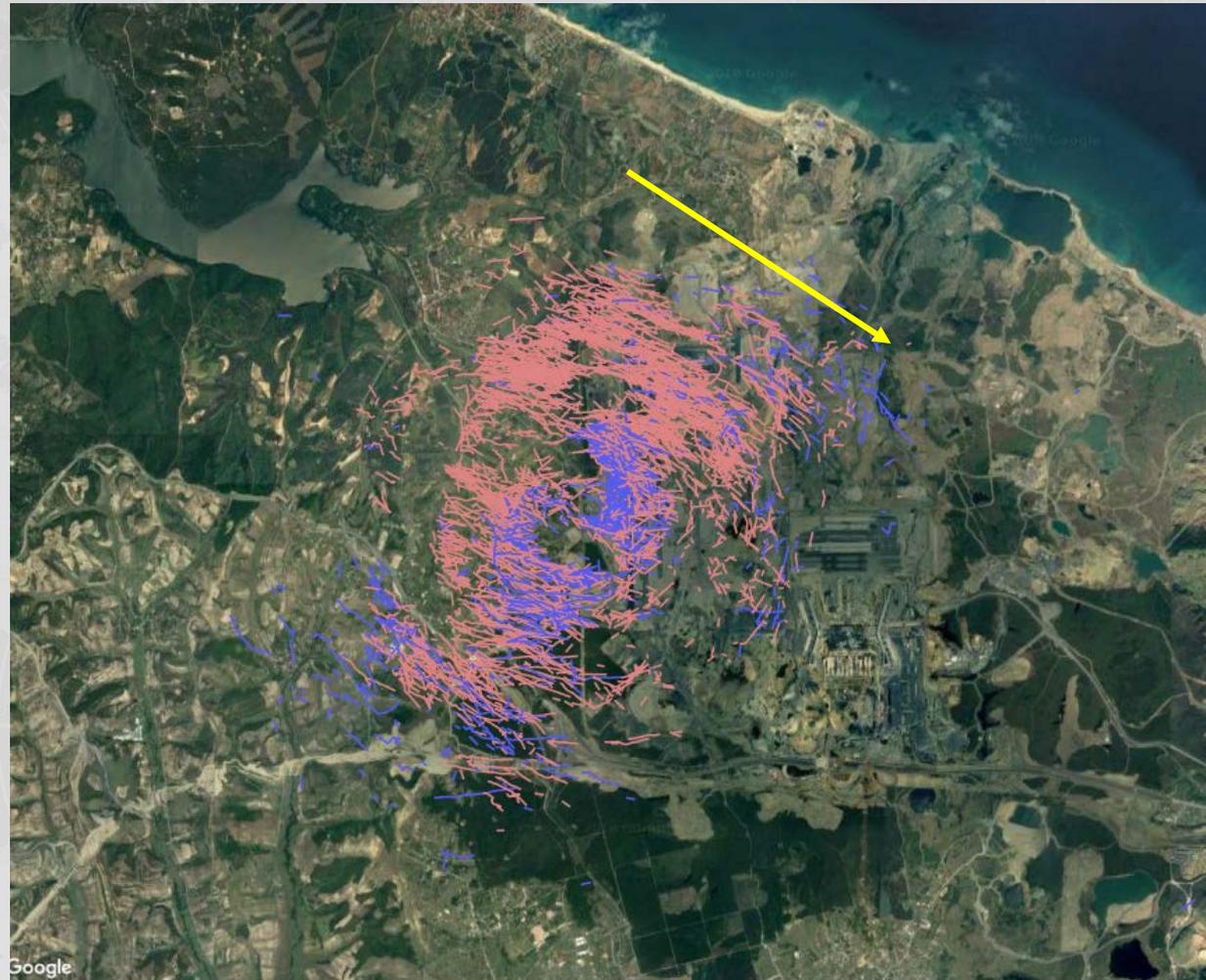
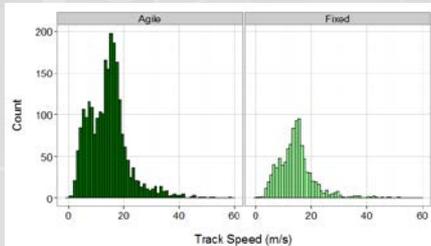
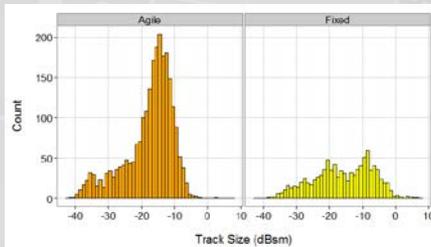
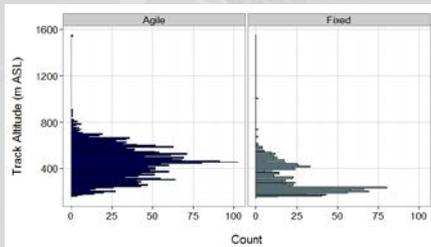


Time Manager

Settings Export Video Time frame start: 2018-03-11 17:00:00.000 Time frame size: 60 minutes

Daytime Autumn Migration

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

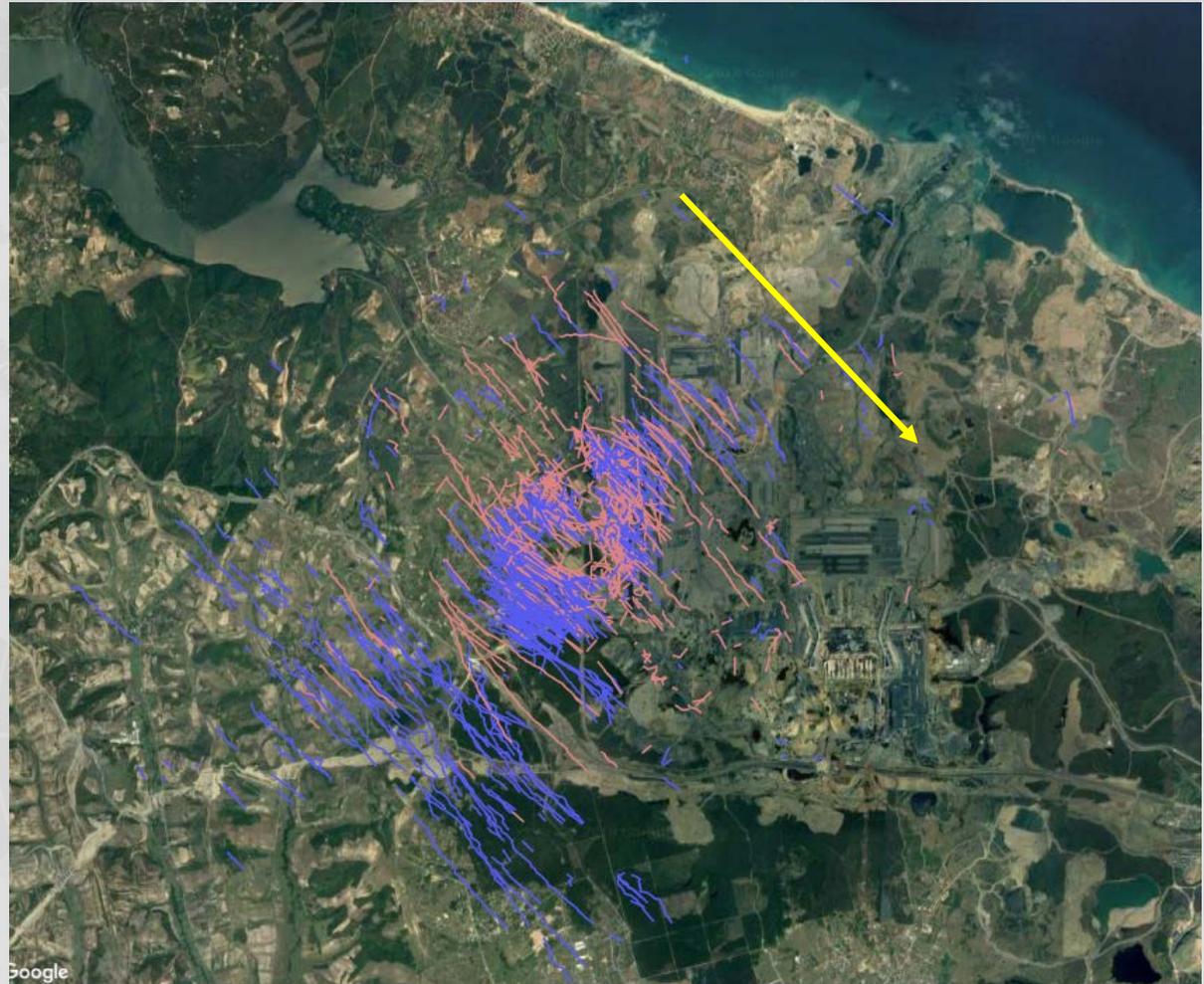
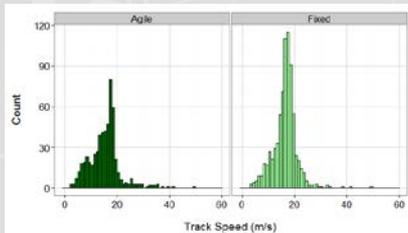
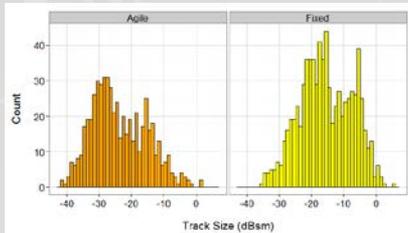
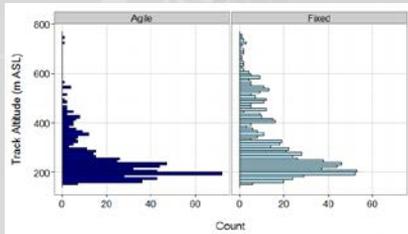


Google Time Manager

Settings Export Video Time frame start: 2017-10-27 10:00:00.000 Time frame size: 60 minutes

Daytime Autumn Migration

- Migrating birds cross the aerodrome during the day
- 29 October 2017, 9-10 am local

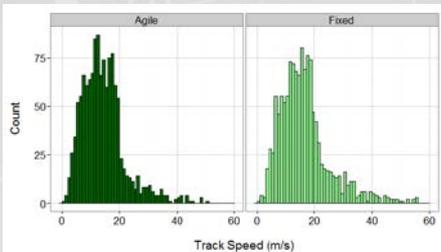
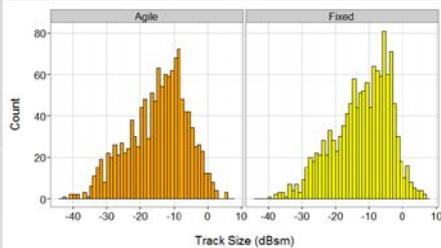
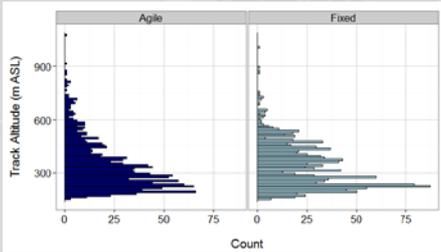


Google Time Manager

Settings Export Video Time frame start: 2017-10-29 06:00:00.000 Time frame size: 60 minutes

Daytime Autumn Migration

- Migrating birds cross the aerodrome during the day
- 18 November 2017, 9-10 am local

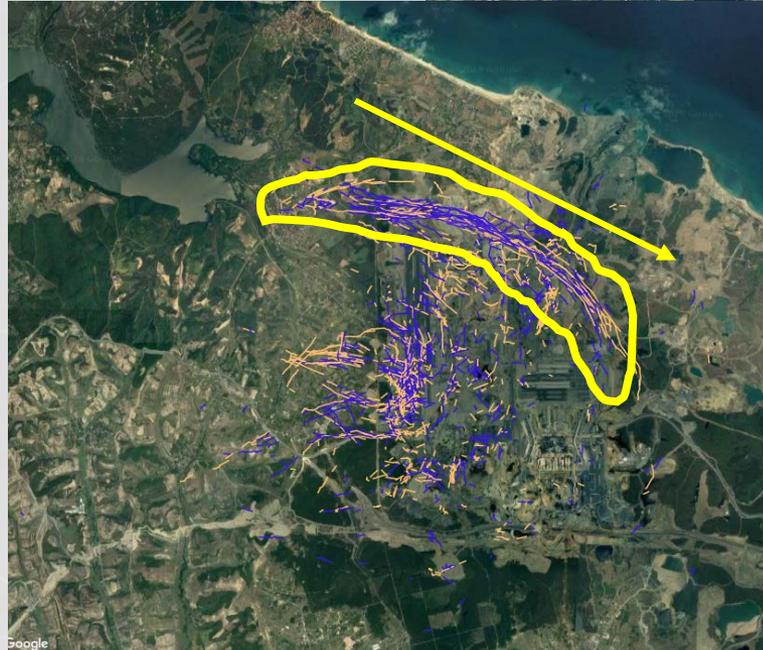
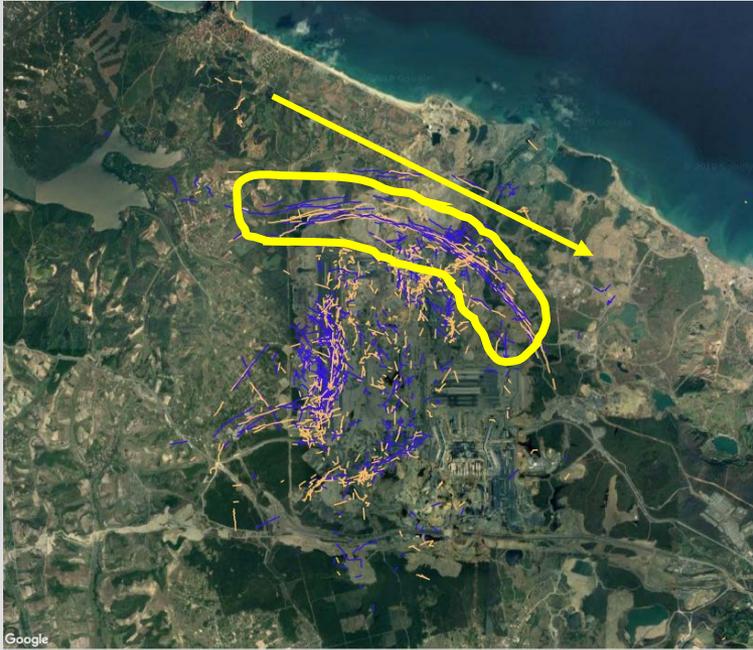
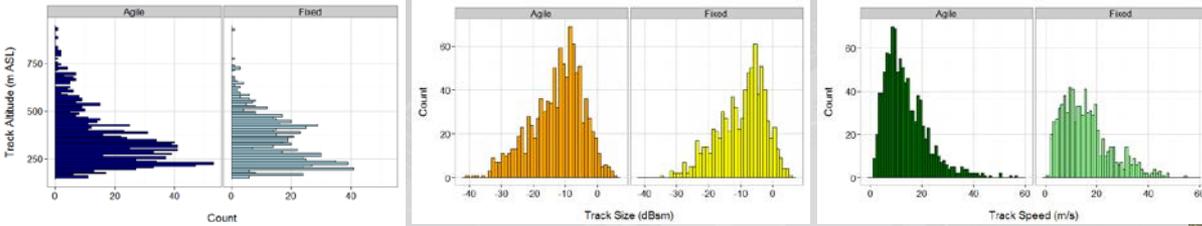


Google Time Manag

Settings Export Video Time frame start: 2017-11-18 06:00:00.000 Time frame size: 60 minutes

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

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

Accipiter® Radar COP

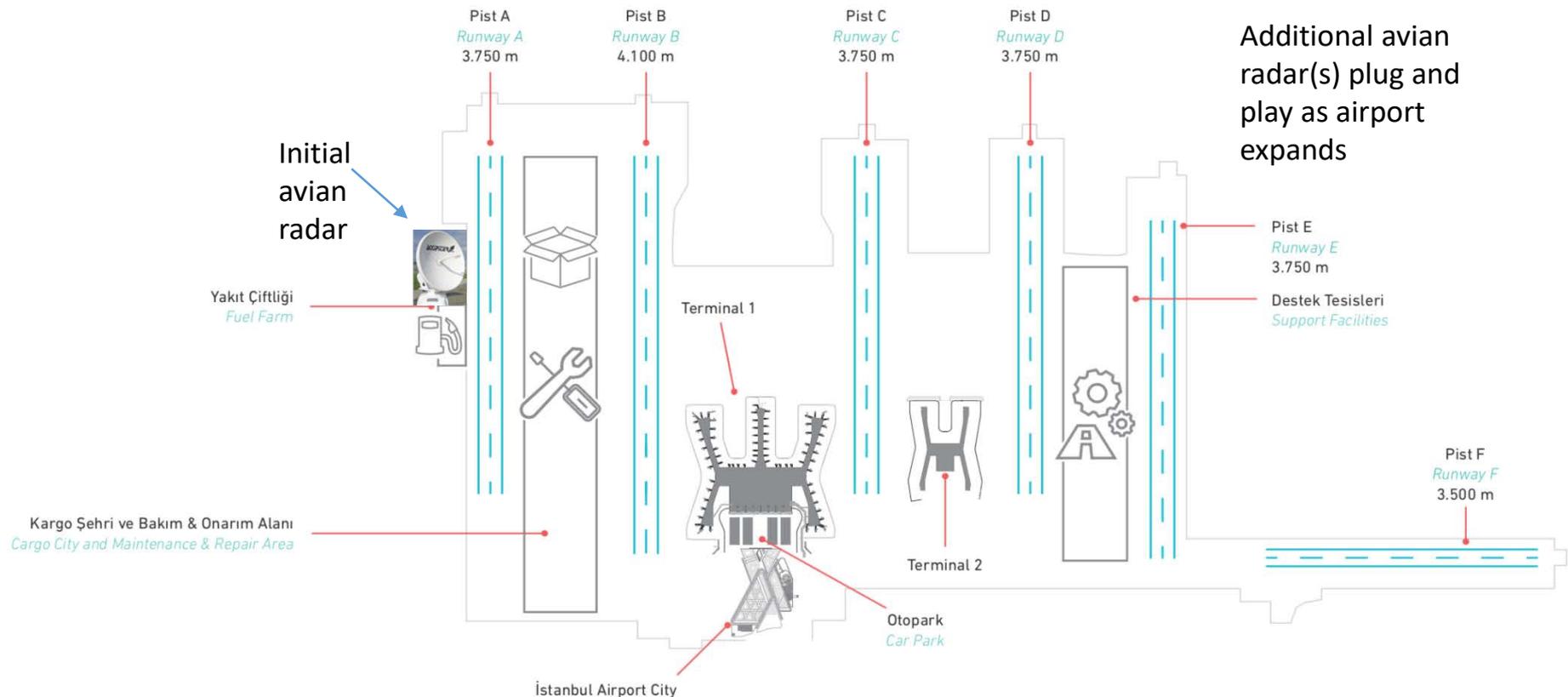
The screenshot displays the Accipiter Cloud Surveillance interface. On the left is a sidebar with the following sections:

- ACCIPITER CLOUD SURVEILLANCE™**
- Radars (Avian)**
 - Radar (Avian)
 - INA-1 Agile Dish
 - INA-1 Fixed Dish
 - IGA Agile - December C...
 - IGA Agile - October Mig...
 - IGA Fixed - December C...
 - IGA Fixed - October Mig...
- Events**
 - Runway 1 N
 - INA Runway 1 S
- Overlays**
 - IGA Observation Points
 - IGA Points of Interest
 - IGA 1 Km Range Rings
 - IGA Spring Migration Routes
 - INA Alerting Zones
 - IGA Project Site
 - INA Project Site 2017
 - Weather

The main map area shows a geographical view of an airport region with labels for Karaburun Mahalesi, Durusu, Germe, Baklali, and yalık. A large satellite-style inset map is overlaid on the right side, showing a detailed view of the airport's runways and taxiways, with several colored markers (blue and yellow) and lines indicating specific radar coverage or alerting zones. The bottom status bar shows a timeline from Dec 06 08:31:40 to Dec 06 08:45, with a 'Live' indicator on the right.

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



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.

1. Nohara, T.J., R. Sowden, R. Perkins, and R. Beason. Aviation Stakeholder Management of Bird Strike Risks – Enhancing Communication Processes to Pilots and Air Traffic Controllers for Information Derived from Avian Radar. International Bird Strike Committee Conference, Stavanger, Norway, 25-29 June 2012.
2. Beason, R., T.J. Nohara and P. Weber. 2013. Beware of the Boojum: caveats and strengths of avian radar. Human-Wildlife Interactions 7(1) 16-46.