The Use of Air Traffic Control Radars to Adapt to Periods of Intense Bird Migration

PHAROVISION

Dr. Nicholas Carter Birdstrike Control Program Pharovision IAF fighter aircraft forbidden to fly below 3000 feet AGL during migration

Developed by Dr. Yossi Leshem Primary "BPZ"s Migratory (Bird Plague Zones Flyways

ISRAEL

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50 million birds cross Israel's narrow airspace twice every year

1.5 million large birds G ISRAEL





















Some Examples

"Sharing the Sky"















Relies on precise locations of both planes and bird flocks

patial/Temporal

Ground Control Approach

"GCA"

Old radar from 1960's – algorithm for bird tracks – 6 to 9 mile range

Ground Control Approach

"GCA"

Upgraded by IAF in 2001 for birds

What the eye sees

What the GCA sees

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East of the line – birds only | West of the line – aircraft This method is used during stable weather and wind





Maximum height (thousands feet) : range x elevation 10

> Here: Raptors (H_{max}= 9x4 = **3.6**')





5-10-21 11:44





Fall migration from Northeast to Southwest

5-10-21 11:46



13-9-21

High Elevation Shows What's Above

12:34

Medium Elevation Shows Wider Picture

12:34

80

13-9-21

5⁰

Low Elevation Shows Wider Version But Not Birds Above

12:34

13-9-21

110



Managing Aircraft





The controller takes all incoming/outgoing planes to the safest circuit / final

Birds signals are treated as aircraft with no radio communication

The goals of using GCA : 1) to find birds in the CTR 2) to separate aircraft from the birds



Takeoffs when GCA was turned off (but turned on just a minute too late...)

Taxa Bridge Taxa





4/3/2018

Autumn migration Towards south (Africa)

Red & Blue paths (corrected) 90-100% of it is in the CTR of Tel-Nof



Local definitions of the actual paths of large bird species

Important for understanding the local broad picture



Due to weakening west vector of daily winds, all the birds' paths shifted into the flight circuits of **Tel-Nof instead of** just part of them as in prior years (2009-2016)



F	E	D	C	В	A
0010	main anasias	motor	mataa	migration	date of
2018	main species	notes	notes	strengh	September
עיקר נדידת הסתיו - בחודש זה. מז"א בישראל וצפונה עלול לעכב את הנדידה כאן					
U	איות		inter en esta de la companya de la c	3 4	1
Sunday			ועוע בעמייע	3	2
Monday				3	3
Tuesday				3 – <u>4</u>	4
Wednday			(בקעת הידדן)	שונות, <u>4</u> 2	5
Thursday				שונות, 31	6
Friday	A Design of the second second second			שונות, 41	7
Sabat	איות, דורסים אחרים, שקנאים			3 – <u>4</u>	8
Sunday				3 – <u>4</u>	9
Monday		הנדידה –	שיא האמ"ע ומוורנ	3 – <u>4</u>	10
Tuesday		111 1211	כעיקר דורמים –	4	11
Wednday		ה ועררה)	מנתיר מזרחי (רקעו	שונות, <u>4</u> 2	12
Thursday		החופ להריח)	לוחיר מעררי (ריו ו	1-2	13
Friday		······································		1-2	14
Sabat	8			3 – <u>4</u>	15
Sunday				3 – <u>4</u>	16
Monday	איות (מאסף), דיות , ניצים, דורסים		3 <u>4</u>	17	
Tuesday	אחרים, שקנאים			1-2	18
Wednday				2-3	19
Thursday	5			1-2	20
Friday			-	2	21
Sabat				2	22
Sunday				3	23
Monday	דיות, עיטי חורש, ניצי קצייא,			3 – <u>4</u>	24
Tuesday	חסידות שחורות, שקנאים			3 <u>4</u>	25
Wednday				2	26
Thursday				2 3	27
Friday				2-3	28
Sabat	עיטי חורש, דיות, שקנאים	<u>תלות חזקה במז"א</u> תיתכן נדידה של		3	29
Sunday		עשרות אלפי עיטי חורש בזמן קצר		2	30

Bird Migration Forecast Chart

Pros and Cons of the GCA **Cloud radar from early 1960's – not** in use since the 90's + 360° search every 3 seconds + Range 0-7 miles (10 miles for storks) + Accurate spatial location (accurate radial & range - height is calculated) -100 feet accuracy + Birds are simply "non-communicating" aircraft

Pros and Cons of the GCA

Without GCA, spatial location is not possible

- Need to constantly change elevation

- Maintenance of very old system

- No documentation produced for analysis

- Simple to operate but very difficult to understand well (lots of experience needed)

Old Dog, New Tricks

Take Home Message

Flights can be managed even in the worst migration in the worst location – with some expertise and the right tool