



International Civil Aviation Organization

Runway and Ground Safety Working Group

Second Meeting (RGS WG/4)
(Cairo, Egypt, 05-07 November 2017)

Agenda Item3: Implementation of Aerodrome Safety Priorities and Objectives in the MID Region

**IMPLEMENTATION OF RSAs RELATED TO RGS WILDLIFE HAZARD
MANAGEMENT PLAN TEMPLATE
LASER ATTACK SAFETY GUIDELINES CASE STUDY**

(Presented by Sudan)

SUMMARY

This paper presents the proposed part of MID-RAST/RGS/DIP deliverables, based on the work of the Sudanese Civil Aviation Authority, the United Arab Emirates Civil Aviation Authority and the Egyptian Civil Aviation Authority in collaboration with the ICAO MID Regional Office within the framework of the Regional Aviation Safety Group - Middle East (RASG-MID). SEIs and DIPs for MID Region Supplements to RSAs address the Wildlife Hazard Management Plan (WHMP) template, Laser Attacks case study and Aerodrome Safeguarding tool kit.

Action by the meeting is at paragraph 3.

REFERENCES

- Annex 14 – Aerodromes.
- ICAO Airport Services Part 3 Doc. 9137.
- SMS Regulation Annex 19
- RSA 13 /2017 Detailed Implementation Plan (DIP) for the SEI on Wildlife Management and Control regulatory framework guidance material.
- RSA 12/2017 Detailed Implementation Plan (DIP) for the SEI on Laser Attack Safety Guidelines
- RSA 11/2017 Detailed Implementation Plan (DIP) for the SEI on Safeguarding of Aerodrome

1. INTRODUCTION

1.1 This document has been compiled to provide guidance for civil aviation regulators, aerodrome operators and other stakeholders in order to enhance aviation safety. It is not intended to

supersede or replace existing materials produced by the States national regulators or in ICAO SARPs. The publication of this document does not prejudice the National Regulator's ability to enforce existing national regulations. To the extent of any inconsistency between this document and the National/International regulations, standards, recommendations or advisory publications, the content of the National/International regulations, standards, recommendations and advisory publications shall prevail.

2. DISCUSSION

2.1 The goal of the Wildlife Hazard Management Plan (WHMP) at **Appendix A**, is to minimise risk for passengers and flight crews by reducing wildlife hazards and associated risks to aircraft and airport operations caused by wildlife activities on and in the vicinity of the airport.

2.2 RASG-MID/6 reviewed the Detailed Implementation Plan (DIP) for the SEI on Wildlife Hazard Management and Control that calls for a WHMC plan template as in **Appendix B**.

2.3 The goal of the WHMC Plan is to minimise risk for passengers and flight crews by reducing wildlife hazards and associated risks to aircraft and airport operations caused by wildlife activities on and in the vicinity of the airport.

2.4 The objectives of the WHMC Plan are to:

- a. Target high and moderate risk species and habitats that primarily support them both on and off the airport.
- b. Ensure compliance with all relevant airport operational and environmental legislation and regulations.
- c. Ensure that adequate systems are in place to define roles, responsibilities and procedures for managing wildlife risks at [ANY AIRPORT].
- d. Define the methods by which wildlife hazards are managed at [ANY AIRPORT].
- e. Develop performance goals and targets for management of wildlife issues and outline how these will be assessed and reviewed.

2.5 The goal of the Laser Attack Safety Case Study Guidelines at **Appendix C**, is to propose model for practical application by Civil Aviation Authorities and to provide Air Traffic Controllers and Pilot best practices (checklists) for applying ICAO protection zones (LFFZ, LCFZ, and LSFZ) required for the safety of aircraft operations on and in the vicinity of aerodromes.

2.6 RASG-MID/6 reviewed the Detailed Implementation Plan (DIP) for the SEI on Laser Attack Safety Guideline that calls for a case study as in **Appendix D**.

2.7 The objectives of the Laser Attack Safety guideline case study are:

- a. provide effective coordination between all stakeholders by establishing Local Laser Working Group (LLWG);
- b. managing and controlling risk by identifying hazards and assess risk with Root cause and gap analysis;
- c. establishing data base to provide trends for targeted airports;
- d. finally, to provide Mitigation Measures and Safety recommendations to achieve Safe operations at airports, rolling out the plan progressively to airports across country;

- e. provide guidance material for CAA to establish training campaign for pilots, awareness campaign for ATCO and Public awareness campaign; and
- f. could be used as an oversight audit tool by CAA.

2.8 The goal of the Safeguarding of Aerodromes Toolkit as at **Appendix E**, is to minimise risk for aircraft operations activities on and in the vicinity of the airport.

2.9 The may wish to recall that RGS WG/3 has reviewed both, the safeguarding regulatory framework guidance and its toolkit and that only the regulatory framework guidance was endorsed by RSC/5 meeting.

2.10 The meeting may wish to agree on WHMC Plan Template, Case Study on Laser attacks safety and safeguarding of aerodrome toolkit as complementary and supplements to MID RSA-13, MID RSA-12 and MID RSA-11 respectively.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

- a) note the information in this working paper;
- b) agree on the proposed Wildlife Hazard Management Plan (WHMP) Template;
- c) agree on the Laser Attack case study;
- d) agree on the safeguarding of aerodrome toolkit; and
- e) take appropriate actions to support implementation guided by these Documents as complementary and supplement to:
 - the RSA 013 related to Wildlife Hazard Management and Control Regulatory Framework as Guiding Material; and
 - The RSA 012 related to Laser Attack Safety Guidelines as guidance material.
 - The RSA 011 related to safeguarding of aerodrome toolkit

APPENDIX A

RASG-MID SAFETY ADVISORY – 0x
(RSA-0x)



XXX 2017

Guidance on

**WILDLIFE HAZARD MANAGEMENT
AND CONTROL PLAN TEMPLATE**

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Disclaimer

These guidelines are developed by the Runway and Ground Safety Working Group (RGS WG), as part of MID-RAST/RGS/** DIP deliverables, based on the work of the Sudanese Civil Aviation Authority, the United Arab Emirates Civil Aviation Authority and the Egyptian Civil Aviation Authority in collaboration with the ICAO MID Regional Office within the framework of the Regional Aviation Safety Group - Middle East (RASG-MID).

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ANYNAME? AERODROME

**WILDLIFE HAZARD MANAGEMENT
PLAN**

PAGE AMENDMENT LOG

Date of Amendment	Pages

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Company/Aerodrome Name

Wildlife Hazard Management Plan (WHMP)

Issue 1

Date:

Chapter 1:

1.1 Goals and Objectives

The goal of this WHMP is to minimise risk for passengers and flight crews by reducing wildlife hazards and associated risks to aircraft and airport operations caused by wildlife activities on and in the vicinity of the airport.

The objectives of the WHMP are to:

- Target high and moderate risk species and habitats that primarily support them both on and off the airport
- Ensure compliance with all relevant airport operational and environmental legislation and regulations
- Ensure that adequate systems are in place to define roles, responsibilities and procedures for managing wildlife risks at [ANY AIRPORT]
- Define the methods by which wildlife hazards are managed at [ANY AIRPORT]
- Develop performance goals and targets for management of wildlife issues and outline how these will be assessed and reviewed

[Add to or delete as appropriate]

1.2 The Airport

[ANY AIRPORT] is situated in the [LOCAL GOVERNMENT AREA NAME] in [STATE/TERRITORY]. A description of the airport is provided in Table 1 below.

Table 1 - [ANY AIRPORT] general information

Element	Description
Airport location	[DESCRIPTION]
Surrounding land use(s)	[DESCRIPTION]
Elevation	[DESCRIPTION]
Airport ownership	[DESCRIPTION]
Airport operator	[DESCRIPTION]
Traffic profile	[DESCRIPTION]
Runways no./ designation	[DESCRIPTION]
Navigation aids	[DESCRIPTION]
Communications	[DESCRIPTION]
Hours of operation	[DESCRIPTION]
Climate	[DESCRIPTION]
Other	[DESCRIPTION]

1.3 The Management of the wildlife / bird strike Risk (Policy Statement)

[ANY AIRPORT] is committed to ensuring the safety of aircraft using [ANY AIRPORT]. While the safety of aircraft at [ANY AIRPORT] is paramount, it is not possible to prevent all wildlife strikes. The WHMP aims to reduce the frequency and severity of strikes by focusing management efforts on species and habitats that constitute significant hazards to aircraft that operate at [ANY AIRPORT].

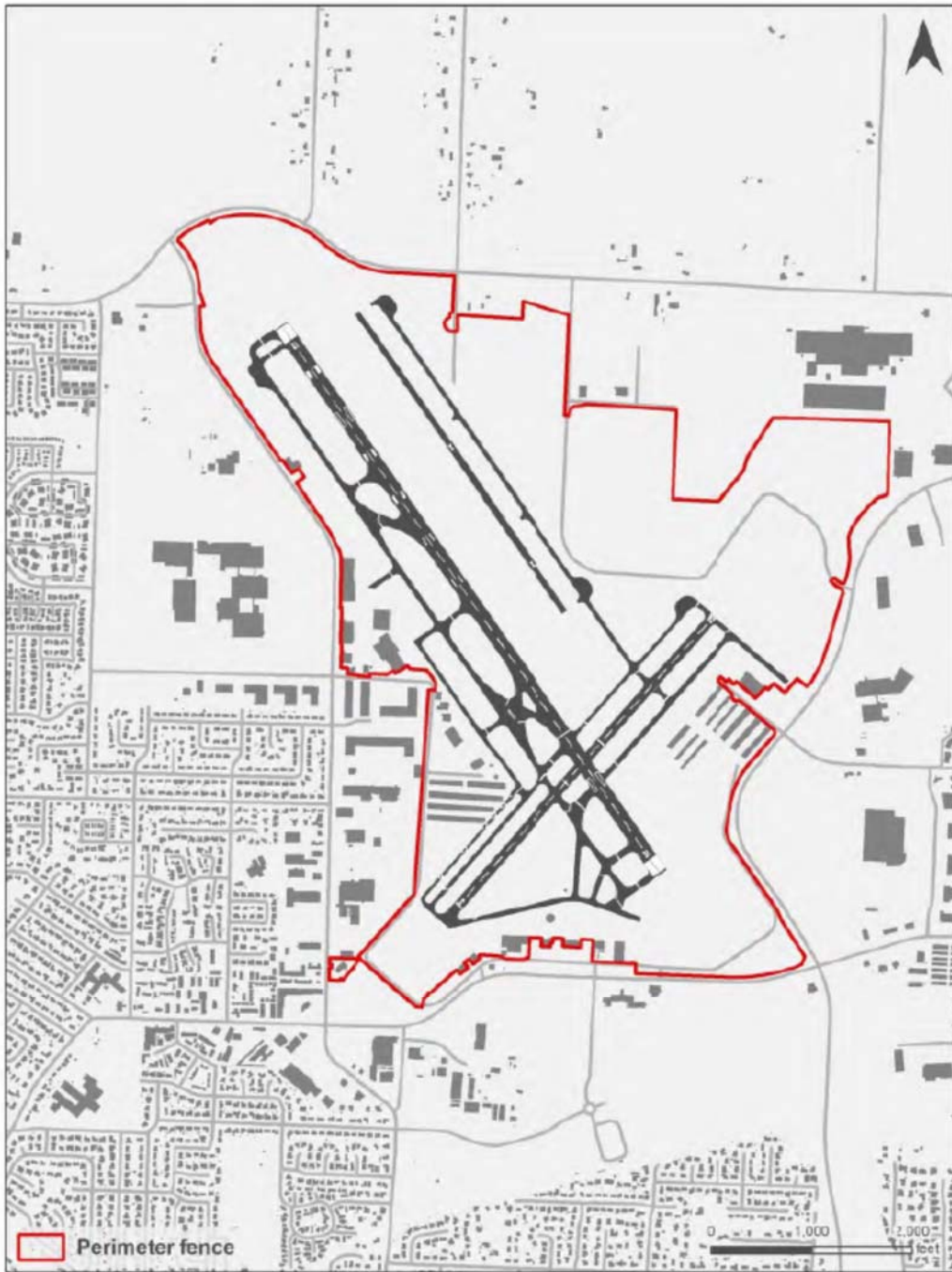
[Add to or delete as appropriate or insert your existing airport policy relating to wildlife management]

ANYAIRPORT have measures in place, which are aimed at deterring wildlife and birds from settling, and flying on and in the lower flight paths in the vicinity of the airfield as is reasonably practicable.

These measures include:

- Hazard Identification and Risk Assessment of bird activity (see SMS Doc)
- A Wildlife Hazard Management Plan (WHMP)
- Control procedures introduced aimed at reducing the presence of wildlife birds on the airfield and therefore reducing the risk of a wildlife / bird strike.
- The effective use of resources and equipment?
- A suitably trained wildlife / bird Control Co-Ordinator (WCCO) to oversee the Wildlife Hazard Management Plan

These measures reflect the principles of safety management which the Aerodrome Operator is required to apply to all aspects of aircraft operations within its responsibility.



Airport layout plan

Wildlife Hazard Management Plan

Chapter 2

1. Roles & Responsibilities

The roles and responsibilities of **ANYAIRPORT** staff are important elements of the Aerodrome Operator's Safety Management System and a contribution to the effectiveness of the WHMP. All staff will have a thorough understanding of their roles within the plan. The roles and responsibilities are detailed below:

1.1. Aerodrome Manager/**wildlife / bird** Control Manager

The Overall accountability for bird control lies with the Aerodrome Licence holder/Director/Safety Action Group (SAG), However, the responsibility could be delegated to the Aerodrome Manager/BCCO whose core responsibilities are to:

- Assess the **wildlife / bird** strike risk level
- Determine policy and produce and review the WHMP
- Implement the WHMP
- Ensure the inclusion in the Aerodrome manual is correct

The role includes the following tasks:

- Monitoring and acting on **wildlife / bird** behavior on and in the vicinity of the Aerodrome
- Implementation of habitat management i.e.: Vegetation policy, maintenance programmes in accordance with WHMP and to review and introduce modifications to this programme when necessary
- Analyse and interpret the log records of bird control activity and bird strike Reports and ensure this information is promulgated to all stakeholder and the accountable person
- Regular surveys of **wildlife / bird** concentration and movements in the local area.
Liaising with local **wildlife / bird** watchers associations for further information
- Liaise with local land owners and game keepers to obtain information on farming plans, game conservation etc
- Seeking advice and assistance where appropriate from Local Planning Authority and outside specialists on matters requiring expert advice
- To ensure the WHMP reflect the current policy of the CAA and best practice in the aviation industry.

Wildlife Hazard Management Plan

1.2. **wildlife / bird Control Co-Ordinator (WCCO) and Deputy (or equivalent position)**

The overall responsibility for **wildlife / bird** control lies with the Aerodrome Manager/**wildlife / bird** control manager however the day-to-day management and efficient implementation of the WHMP lies with the wCCO. (The wCCO should have had some training on the subject and preferably have an active interest in bird control)

Their role includes the following tasks:

- Advise the Aerodrome Manager on all matters relating to **wildlife / bird** activity and **wildlife / bird** strike prevention
- Plan and organise all **wildlife / bird** control operations in accordance with the WHMP
- Ensure bird control operations are implemented in accordance with the WHMP
- Supervise bird control record keeping
- Assist with the supervision of intelligence gathering and planning
- Ensure the correct maintenance of the **wildlife / bird** control equipment
- Provide information and communications between all interested parties/stakeholders
- Provide a periodic (could be quarterly, six monthly or annual) **wildlife / bird** control report to the accountable person/s

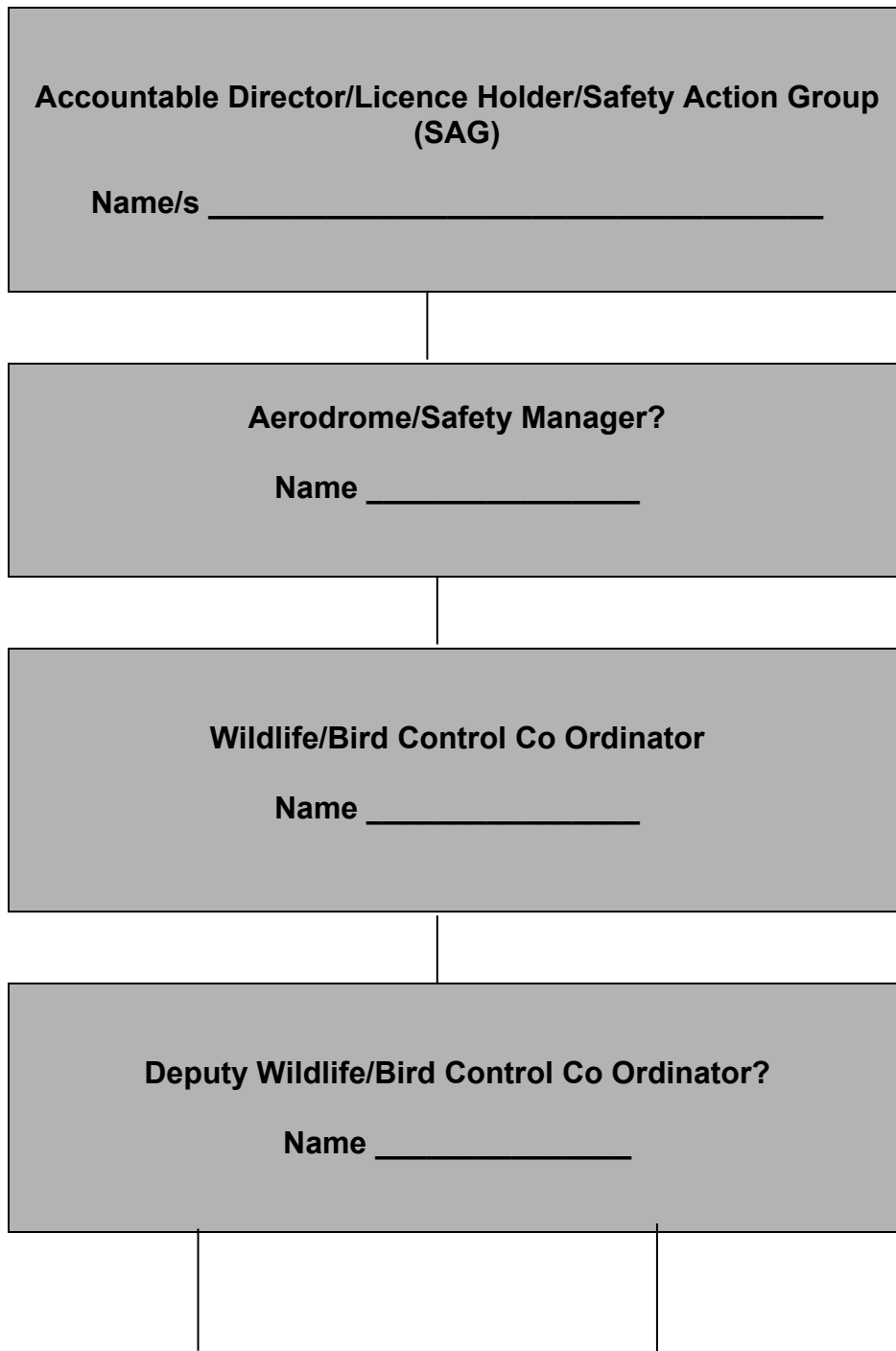
1.3. The **wildlife / bird** control operator performs the front line role.

Their role includes the following tasks:

- Maintain proactive surveillance of **wildlife / bird** activity on the airfield
- Implement active **wildlife / bird** control measures in accordance with the WHMP
- To reduce wherever possible any identified **wildlife / bird** strike risk
- Record **wildlife / bird** and **wildlife / bird** control activity including any dispersal methods used
- Record and report actual, potential or suspected **wildlife / bird** strikes

*Note: Appendix E Key Roles And Responsibilities in RSG *** provides a guide for the key roles and responsibility, for further information can be found: ICAO Airport Service Manual, part 3, Wildlife Control and Reduction, 3.3 Role of the Airport*

2. FLOW CHART



Wildlife/Bird Control Operator/Dept
Name/s _____

Wildlife/Bird Control Operator/Dept
Name/s _____

Wildlife Hazard Management Plan

Chapter 3

1. hazard Identification

In order to manage the risk of a **wildlife / bird** strike, _____ aerodrome has developed a procedure for obtaining information regarding the potential **wildlife / bird** strike risk. **wildlife / bird** Activity on and in the vicinity of the airfield is assessed on a regular basis and a Hazard Log/Risk Assessment produced.

Probability and severity of a risk vary with species, i.e. geese or skylark and time of year for a particular species i.e. rooks peak in March/April.

*Note: Appendix c in **RSG ***** provides a guide for the Risk Analysis
for further information can be found: ICAO Airport Service Manual, part 3, Wildlife Control and Reduction, ch 6 , icao doc 9859 and ACI Wildlife Hazard Management Handbook Section 3*

2. EXAMPLE HAZARD LOG

HAZARD IDENTIFICATION	RISK ASSESSMENT DONE	RISK ACCEPTABLE?
Wood pigeon activity on the south side of the aerodrome	03/07/08 and filed in ref	Yes

3. **EXAMPLE RISK ASSESSMENT** carried out for
Bird Activity on the Aerodrome

Significant Hazards identified from (name source) eg MOR	Severity Value (S) <i>(see 1)</i>	Likelihood Value (L) <i>(see 1)</i>	Level of Risk (S x L) <i>(see 2)</i>	Control Measures to be Implemented	Action By:	Revised Level of Risk <i>(see 3)</i>
Wood pigeon activity on the south side of the aerodrome						

1. For Severity and Likelihood Value, refer to Risk Assessment Matrix attached
2. For Level of Risk, multiply Severity Value x Likelihood Value
3. For Revised Level of Risk, repeat Severity Value x Likelihood Value after implementing control measures

<u>Level of Risk Key:</u>	
1 to 4	Risk Acceptable
5 to 9	Risk undesirable (but tolerable)
10 to 25	Risk Unacceptable

Wildlife Hazard Management Plan

Chapter 4

Risk Reduction

Prevention of a bird strike is not always possible, so to reduce the risk a WHMP has been formulated and introduced as part of Anynames Aerodromes Safety Management System (SMS).

Our Airfield activities include (Examples: the correct use of the 'Scarecrow Bio-acoustic system', trained staff, recording bird activity and dispersal, habitat management i.e. vegetation removal/cutting and/or grass treatment, culling activity with the local gun club).

Good control should be achievable on the airfield: however, off airfield, control could be less achievable. (See page 10)

Wildlife Hazard Management Plan

Chapter 5

1. Bird strike Reporting

1.1. Bird/wildlife incidents are defined in(*demonstrate your incident reporting system , this system may be electronic or other*) . These are:

1. Confirmed Strikes
2. Unconfirmed Strikes
3. Serious incidents

1.2. The airfield records all bird strikes as far as it is able. This data is submitted to the CAA by electronic/other format standard reporting form.

The form can be found in (Aerodrome Reference Document _____)

2. Online Reporting

The UAE online reporting system, can be used as a guide to establish reporting system of incident reported

<https://www.gcaa.gov.ae/en/rosi/Pages/home.aspx>

Wildlife Hazard Management Plan

Chapter 6

1. Bird/Wildlife Management of the Airfield

1.1. ICAO defines the vicinity of an aerodrome as a 13km bird circle surrounding the airfield. The **anytime** aerodrome conducts annually a survey of 'Off airfield' issues. These include current developments and proposed developments such as for example:

- Landfill sites (food waste attracts gulls and starlings which travel up to 30miles)
 - Aggregate developments (large areas filled with water attract feral geese etc)
 - Industrial developments with flat roofs (these provide a safe breeding habitat for gulls and waders)
 - Sustainable Drainage Schemes (SUDS) which attract feral geese and wildfowl
 - Amenity planning (short grass and bird feeding by the public attract various species)
 - Golf Courses (water and short grass attract feral geese etc)
 - Nature Reserves (designed to improve bio-diversity attract several species)
- Airport Developments

1.2. The **airport operator** seeks to have input into planning decisions and land use practices within the 13km bird circle for **liaison with non-airport agencies and local landowners** for any development that may attract significant numbers of hazardous birds/wildlife. Any new developments (**crop harvesting, seed planting, ploughing, establishment of land or water features, hunting, etc., that might attract birds/wildlife**) are subjected to the aerodrome safeguarding policy and to a risk assessment process and changes to the proposal sought or opposed if a significant increase in bird activity is likely and bird strike risk is increased as a result

2. LIST ALL SITES BELOW (High Risk within 5km)

2.1. These sites identified are all within 5km of the airfield and are listed below, numbered in order of risk to the aerodrome, with a summary of the site, and these sites are illustrated on the Bird Circle map **/wild life attraction maps**

1. **Anynone mere**
2. Anynone water park
3. Anynone nature reserve
4. Anynone refuse disposal site

2.2. These sites are outside the 5km ~~bird circle~~, but fall within the ICAO 13km circle surrounding the airfield, however they attract significant wildlife /bird species and are included for the purpose of bird/wildlife management off airfield.

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3. LIST ALL SITES BELOW (Low Risk outside 5km but within 13km)

5. **Anyname Fishing Club**
6. Anyname Housing Development

EXAMPLES of what a LOW/HIGH risk site information plan might look like:

Protocol of site information for priority targets

Ref: 5	Risk: LOW	Site:	Name of site	
Description	Medium sized fishing lake?			
Os grid ref	SJ813713	Co-ordinates		381375 371375
Distance from airport	6.4 miles	Bearing in degrees		178.50
Contact	Name of Fishing Club or person in charge.		Telephone	
Month visited/date		Time		
Site description				
Area/size of water body	Approx			
Adjacent terrestrial habitat				
Photograph				
Aerial photograph				
Usage	Private fishing club. No public access and no sign of disturbance other than fishing.			
Management	Well-managed site by the Fishing Club Committee and happy to provide updates on bird activity when requested?			
Species name	Population count	Acitivity		
Canada Geese	4	roosting		
Coot	3	present		
Mallard	8	present/ roosting		
Little Grebe	1	Calling (territorial display)		

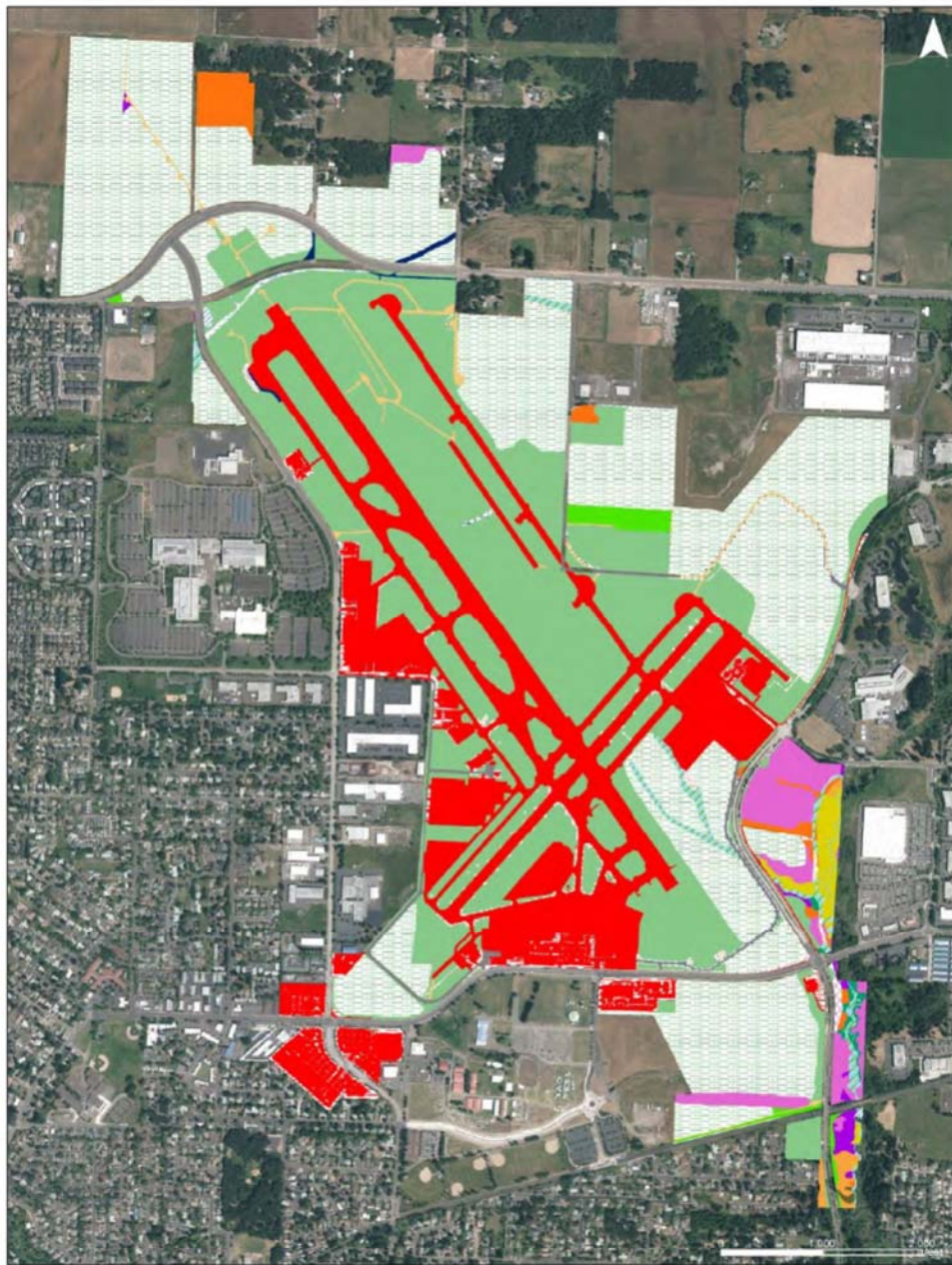
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Ref: 1	Risk: HIGH	Site:	Anyname Mere	
Description	Mere with island			
Os grid ref (Optional)	SJ766785	Co-ordinates		376750 378434
Distance from airport	2.8 miles	Bearing in degrees		219.00
Contact	Could be Local Council		Telephone	
Month visited/date		Time		
Site description				
Area/size of water body	Approx			
Adjacent terrestrial habitat				
Photograph				
Aerial photograph				
Usage	There appears to be public access around most of the mere's perimeter. There is evidence of dog walking and recreational use by family and children for picnics etc that could be a bird attractant.			
Management				
Species name	Population count	Acitivity		
Canada Geese	200	feeding		
Moorhen	1	present		
Lapwings	300+	present		
Mallard	30	feeding/ roosting		
Coot	6	territorial disputes		
Swans	2	feeding		
Black Headed Gulls	40	present		

EXAMPLES of what a site plan might look like:

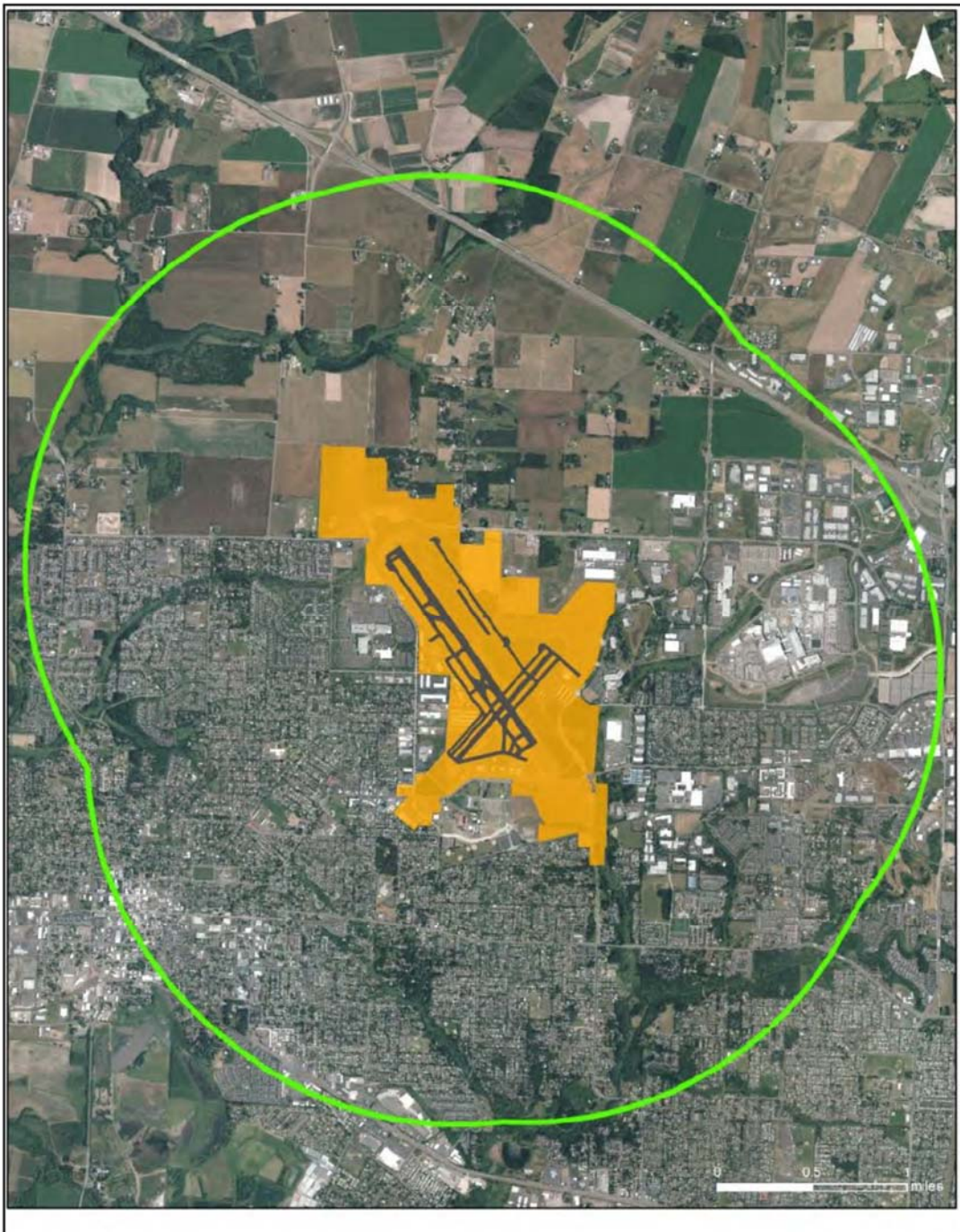


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Local wildlife habitat classes

blackberry scrub - shrub	ditch	mixed conifer - hardwood (planted)
channel	ditch - roadside	pond
conifer	grass/forb - mowed	railroad - crushed rock
conifer (planted)	hardwood	road - dirt
cottonwood, willow scrub - shrub	herbaceous upland	road - gravel
cottonwood, willow, ash forest	herbaceous upland (planted)	road - paved
developed - cultivated	hydrophytic vegetation	scrub - shrub
developed - impervious	improved pasture - perennial grass seed/hay	stream
developed - pervious	mixed conifer - hardwood	



Insert Maps / Bird Circle Map

Plot the sites identified on to the Bird Circle map

Wildlife Hazard Management Plan

Chapter 7

Aerodrome Ornithology

Wildlife/Bird control personnel are able to identify correctly and be familiar with the behavior of all birds species commonly encountered on the airfield and identified with in this WHMP. This information can be found in the WHMP file (wildlife/bird description and possibly a photograph).

Add photographs of most common species with a description and some information in regards to behavior and seasonal activity.

APPENDIX B

DIP Tracking for MID-RAST/RGS/5

Wildlife Management Control

RGS/5 DIP Deliverable	Target Date	Status	Comments
RSA for Regulatory Framework & Guidance Materials	August 2016	Completed	Draft RASG-MID Safety Advisory (RSA-13), <i>Wildlife Management Regulatory Framework & Guidance Materials</i> , is included as part of RASGMID-6 - WP/11 pending endorsement for publication.
Templates on WHMP	End November 2017	In Progress	The templates have been drafted and will be presented to RGS WG/4 (Cairo, Egypt, 5-7 November 2017).
Wildlife Management Control Workshop	September 2018	In Progress	Sudan has offered to host the Workshop in Khartoum in September 2018.



RASG-MID SAFETY ADVISORY – 0X

(RSA-0X)

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MID-Region

Case Study on Laser Attacks

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These guidelines are developed by the Laser Attacks team - Runway and Ground Safety Working Group (RGS WG), as part of MID-RAST/RGS/6 DIP deliverables, based on the work of NANSC

under supervision of the Egyptian Civil Aviation Authority in collaboration with the ICAO MID Regional Office.

Disclaimer

This document is intended to provide guidance for civil aviation regulators, aerodrome operators, air traffic service providers and aircraft operators regarding establishment of Laser Attacks incidents database and a model case study for laser attacks in order to mitigate the risk of laser attacks pointed at an aircraft/ATC tower. Especially, during critical phases of flight, which can cause Loss of Control In-flight (LOC-I) or going around.

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INTRODUCTION

BACKGROUND

Laser (Light Amplification by Stimulated Emission of Radiation) illumination increase every year all over the world. Including the MID Region as reported in **ICAO** annual safety report 2014, also a **CANSO** survey has shown laser attacks are on the increase, moreover, **FAA** had the same results.

In the last three years, there has been an increasing number of laser-beam attacks affecting daily night operations at 3 airports, especially during critical phases of flight (90% of laser illumination was during approach phase at Alpha airport). Hand-held laser-beam attacks affected aircraft and ATC Tower CAP; moreover, Laser illumination, dazzling light and fireworks negatively impacts flight safety, creates hazards. And the safety of pilots eyes, aircraft operations and passengers alike.

Handheld lasers vary in strength, colour and wavelengths (400-700 nm). That is why class and colour classify Lasers. While the FAA says the lasers cause a safety concern, no accidents or aborted take-offs or landings have been reported yet. However, in worst-case scenario, Laser attacks can cause (Go around or, Loss of control in critical positions "LOC-I" or, Damage pilot's eyes).

As a response to that issue, I created a data base of laser beam attacks for 3 years. And as a sample, I started with the main three airports Alpha, Bravo and Charlie. Moreover, I interviewed a random sample of laser pens traders to know the different causes of the phenomenon. There were 230 reported incidents of laser illumination (218 at Alpha, 10 at Bravo, and 2 at Charlie airports) during the study period (3 years for Alpha and 2 years for bravo and Charlie. Total of 7 years), plus (16 dazzling lights, 4 fireworks. Plus 3 laser attacks on ATC Tower) on Alpha airport.

- Occurrence Register at Alpha airport during 3 years shown below:

Location Incident type	Arrival			On ground			TOWER CAP		
	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3
Laser Beam	126	60	32	3	NIL	1	1	1	1
Dazzling Light	12	2	2						
Intense Fireworks	1	NIL	3						

Table 1: Occurrence Register at Alpha Airport for 3 Years

- Occurrence Register at Bravo and Charlie airports during two years as shown below:

Location Incident type	Bravo		Charlie	
	Year 1	Year 2	Year 1	Year 2
Laser Beam	3	7	1	1

Table 2: Register at Bravo and Charlie Airports during 2 years

The main sources of laser are Hand held laser and outdoor Laser light shows inside clubs at night events.

We initiated a plan includes a variety of mitigation methods consists of control and recovery methods, with timetables, procedure for pilots and ATCOs (checklists), Moreover, training and active reporting system at Alpha airport, hazard identification, safety analysis, system gaps, and risk assessment. My study confirms ICAO results because the majority of attacks were during approach phase at Alpha airport during year one.

Finally, we may be able to gradually reduce number of laser-beam incidents, and reduce the severity of a laser beam event when it occurs. Laser incidents reduction percentage during 3 years was almost 70 %. Although, the target was 10% per year at Alpha airport.

PURPOSE

The purpose of this case study is to propose model for practical application by CAA to provide ATCO and pilot best practices (checklists). Applying ICAO protection zones by Plotting the LFFZ, LCFZ, and LSFZ at Alpha airport with AUTOCAD. Provide effective coordination between all stakeholders by establishing Local Laser Working Group (LLWG). How to manage and control risk by identifying hazards and assesse risk with Root cause and gap analysis. Establishing data base to provide trends for Alpha/Bravo/Charlie airports. Finally, to provide Mitigation Measures and Safety recommendations to achieve Safe operations at Alpha airport. Then rolling out the plan progressively to airports across country. As a start Charlie and Bravo Airports. Data provided in this case study may be used parallel with guidance materials provided by CAA to establish training campaign for pilots, awareness campaign for ATCO and Public awareness campaign. Also, it may be used as an oversight audit tool by CAA.

Chapter 1

RISK MANAGEMENT

1.1 CAUSAL FACTOR:

1. The lasers are too easily available at low cost, although it is illegal to aim a laser at an aircraft.
2. Laser pens are useful and fun, but they are all too often misused.
 - One is misuse by the general public.
 - Antisocial or criminal persons.
3. Beam diversion is very low. Laser beam often fills an entire cockpit at thousands of feet away.
4. People still do not understand how potentially dangerous this is.
5. Lack of awareness and training for pilot/ATCOs, lack of recovery methods.
6. Lack of proper procedure for pilots and ATCOs.
7. Insufficient regulations, laws.
8. Lack of coordination between different stakeholders.
9. Street sellers show off the power of laser pointers by pointing at an aircraft in front of the buyers/children to impress them with their products.
10. Use of lasers in outdoor light shows.

1.2 Hazard Identification:

1.2.1 Primary hazard:

- 1- Distraction.
- 2- Glare.
- 3- Temporary Flash blindness.
- 4- Eye injuries.

1.2.2 Methods:

A) Reactive:

- Safety reporting (service providers).

B) Proactive Hazard Identification Methods Through:

The proactive approach is required, so that the hazard is recognized and addressed before it could turn into an occurrence.

- Safety monitoring. (Data base for 3 years).
- Safety trends analysis. (ANSP) 3 years (Time, Location, Color, Type...).
- Safety assessment. (ANSP).
- Surveys.

1.2.3 Hazard Sources Identification:

The main sources of laser are:

- 1-Hand held laser and.
- 2- Laser light shows in clubs at night events.

1.3 Hazard Severity/Probability:

1.3.1 Hazard Consequence:

Laser attacks can cause:

- A- Go around or.
- B- Loss of control in critical positions "LOC-I".
- C- Temporarily damage pilot's vision.
- D- Collision with ground obstacle or aircraft.

1.3.1.2 Severity/Impact: (Who might be harmed?)

A-Effect on operations: may cause go around or loss of control or collision with an aircraft or ground obstacle.

B-Effect on aircrew: physical discomfort and increase in workload, and delay.

C-Effect on ATC service: slight increase in air traffic controller workload.

The criteria for determining the severity was (Phase of flight, Laser factors, beam environment, situational factor, pilot factor, operational factors, day or night ...) as illustrates below.

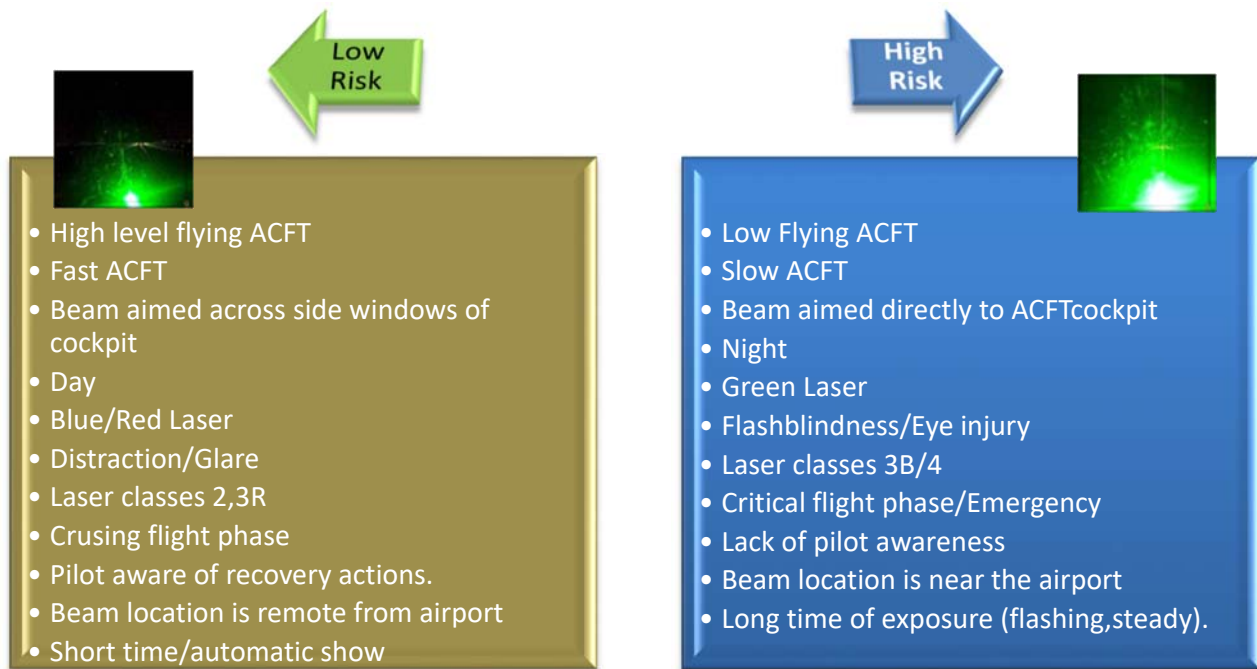


Figure 1: Factors Affecting Severity

1.3.2 Hazard probability:

The annual percentage of laser illumination did not cross 1% of all traffic at the three main airports. By the way these three airports represent approximately 60-70% of all country annual traffic.

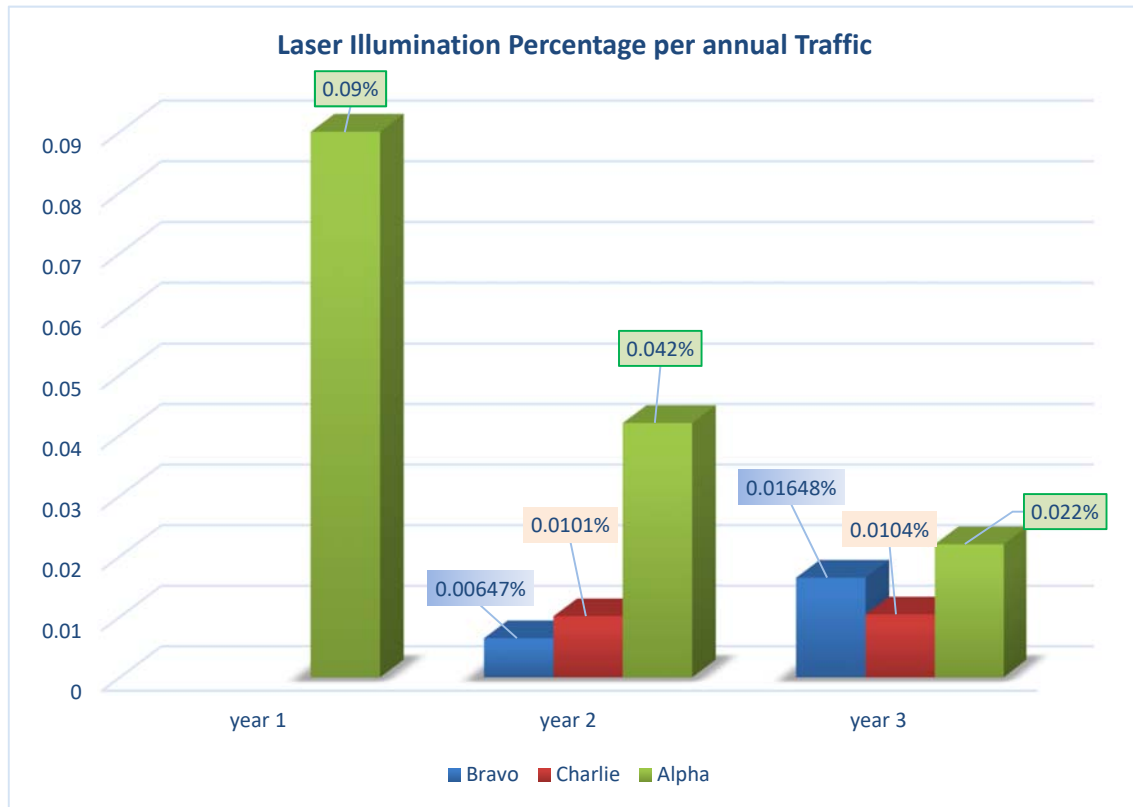


Figure 2: Laser Illumination Percentage per Annual Traffic during 3 Years at Alpha/Bravo/Charlie.

1.4 Risk Assessment at 3 Main Airports:

Risk probability	Risk severity				
	Catastrophic A	Hazardous B	Major C	Minor D	Negligible E
Frequent 5	5A	5B	5C	5D	5E
Occasional 4	4A	4B	4C	4D	4E
Remote 3	3A	3B	3C	3D	3E
Improbable 2	2A	2B	2C	2D	2E
Extremely improbable 1	1A	1B	1C	1D	1E

Alpha
136 in year 1
64 in year 2
32 in year 3

Bravo
3 in Year 1
7 in Year 2

Charlie
1 in Year 1
1 in Year 2

Table 3: Risk Assessment at 3 Main Airports

- **Alpha:** Alpha airport. **Bravo:** Bravo Airport. **Charlie:** Charlie airport.

1.4.1 Risk Volume:

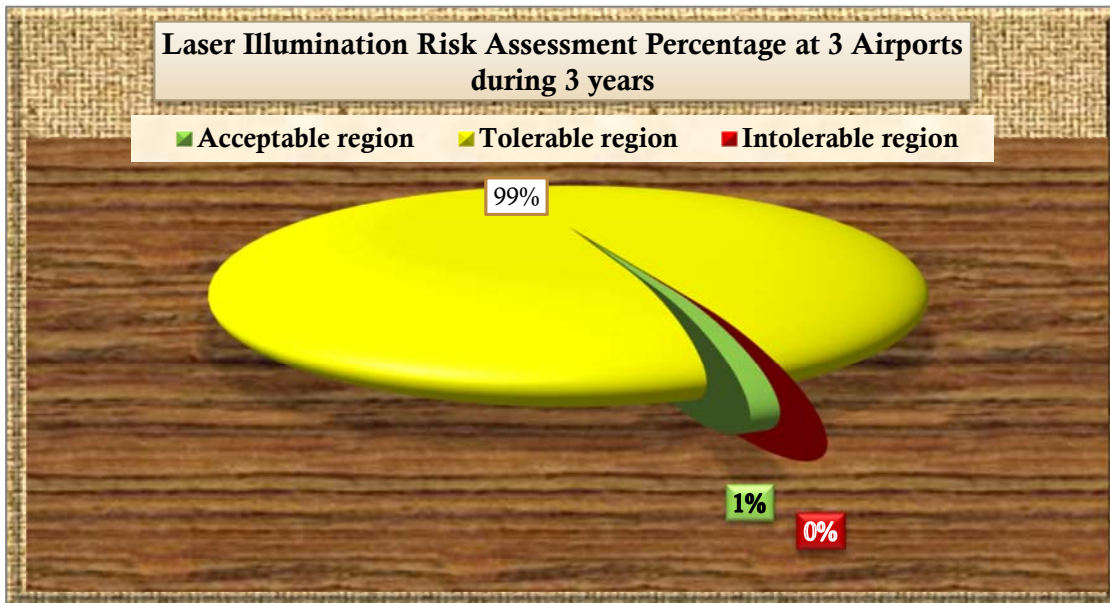


Figure 3: Risk Assessment Percentage in Egypt at 3 Main Airport during 3 years

- High risk or Intolerable risk= 0%, Tolerable risk= 99%, Acceptable risk =1% during 2013-2015.

1.5 Risk control strategy:

- ✓ Avoidance: ATC can avoid landing on high risk runways during events.
- ✓ Reduction: we cannot eliminate laser illumination risk. But we can mitigate it by several means. 99% of the problem in country can be mitigated by our mitigation measures below.
- ✓ Sharing Risk: share risk between (Aircraft Manufacturer, aircraft operator, Air Navigation Service Provider, and Civil Aviation Authority).

1.5.1 Control Measures: (for more information see full mitigation measures page 35).

a) In the air: Pilots shall use laser beam checklist.

b) On ground:

- 1- ATC shall use ATC laser beam checklist after the first incident report.
- 2- CAA shall terminate or increase beam divergence or change the direction of laser beam away from runways extensions during events.
- 3- Restrict sale and import of laser beam class 3B, 4.
- 4- Create new prevention law.

1.6 FISHBONE ANALYSIS:

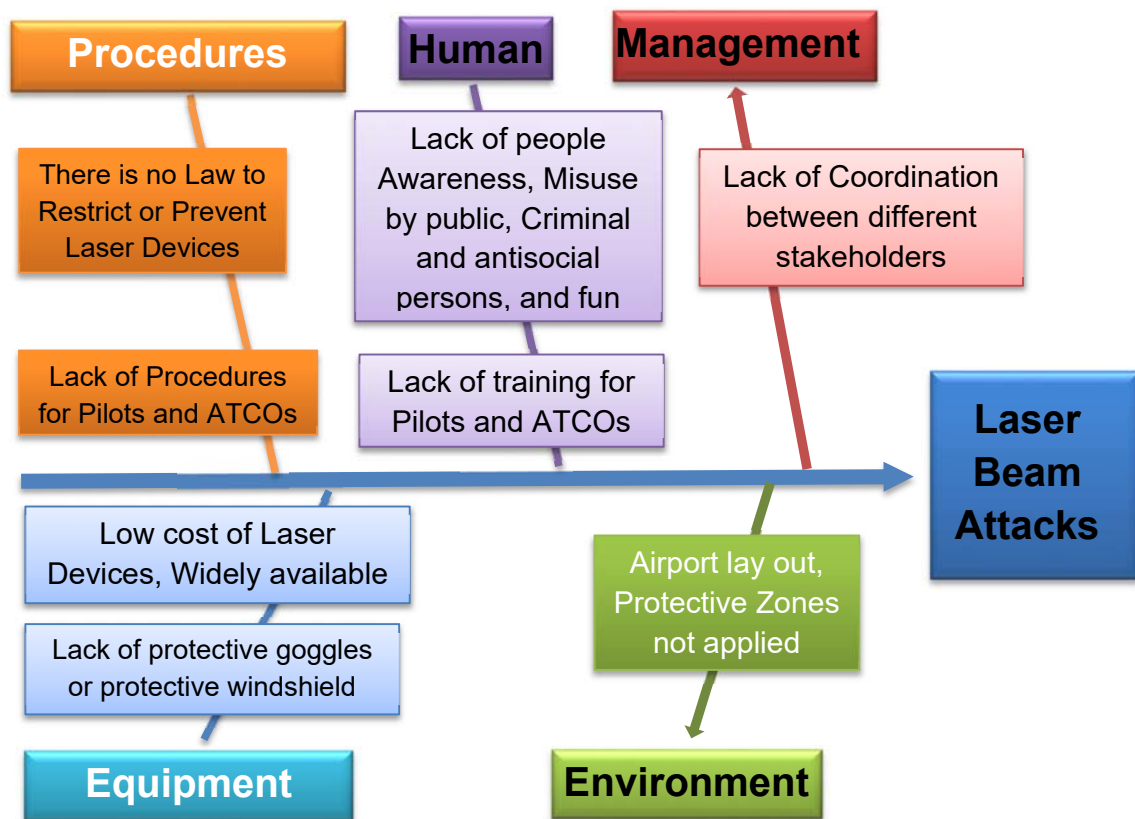


Figure 4: Fishbone Analysis

1.7 GAP ANALYSIS IN REPORTING SYSTEM:

- Part of pilots' community are respondent bias in reporting system.
- Police cannot catch laser attacker because there is no criminal law, more over lack of awareness for public and police.
- Pilots don't provide ATC with sufficient information about an incident report, which would include the location, direction, beam color, length of exposure (flash or intentional tracking), and effect on the crew, and laser location by GPS.
- There is no direct fast way of communication between pilots and police, public and police. Such as mobile applications, hot lines like 911.
- 9 questionnaires were initiated during year two and 13 questionnaires during year three as a survey by me (ATC).including the worst possible scenario, that equals almost half of incident during year three. That is why part of pilots' community are bias in reporting system.

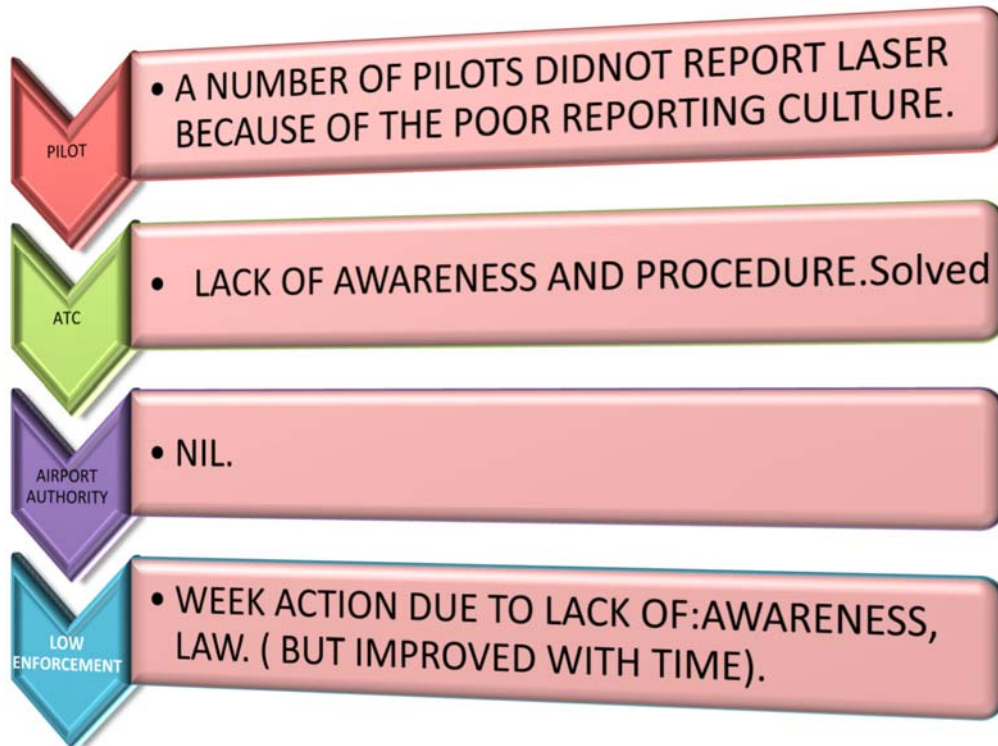


Figure 5: Gap Analysis in Reporting System

Chapter 2

ATCO & PILOT PROSPECTIVE PROCEDURES/BEST PRACTICES

2.1 Proposal for ATC Laser Check list

▪ ACTION BY ATCO	Yes	NO
1- Inform & update information to supervisor to relay information to CRISIS, APP...	<input type="checkbox"/>	<input type="checkbox"/>
2- Coordinate with APP (when pilot requests) to <u>Diverge</u> ACFT from the cleared flight path, or to use <u>different runway</u> or ask for <u>holding</u> until the area has been secured and the threat has ceased. Or restrict flying in a portion of airspace.	<input type="checkbox"/>	<input type="checkbox"/>
3-Use (<u>ATIS</u>) to warn incoming ACFT. Phrase " <i>UNAUTHORIZED LASER ILLUMINATION EVENT.</i> " + General positional location and altitude".	<input type="checkbox"/>	<input type="checkbox"/>
4- Cooperate with law enforcement officials investigating the event.	<input type="checkbox"/>	<input type="checkbox"/>
5- Report to safety office.	<input type="checkbox"/>	<input type="checkbox"/>
6- Issue NOTAM.	<input type="checkbox"/>	<input type="checkbox"/>

Table 4 Proposal for ATC Laser Check List

2.2 Tower Laser Beam Model

NO	A/C Call sign	Type	DEP	ARR	DME/ALT	RWY	Flight phase	Colour	Time	Date
1			<input type="checkbox"/>	<input type="checkbox"/>						
2			<input type="checkbox"/>	<input type="checkbox"/>						

Table 5 Tower Laser Beam Model

2.3 Proposal for Pilot Laser Checklist

▪ ACTION BY PILOTS	YES	NO
1- Look away and Shield eyes from the light source.	<input type="checkbox"/>	<input type="checkbox"/>
2- Use Laser protective eyewear	<input type="checkbox"/>	<input type="checkbox"/>
3- Background lights maximum on PM pilot's discretion.	<input type="checkbox"/>	<input type="checkbox"/>
4- COMMUNICATE with the other crewmember to determine visual condition and status of the aircraft.	<input type="checkbox"/>	<input type="checkbox"/>
5- Transfer control of the aircraft to another pilot.	<input type="checkbox"/>	<input type="checkbox"/>
6- ENGAGE autopilot and coupler for approach and manual landing.	<input type="checkbox"/>	<input type="checkbox"/>
7- If aircraft has auto-land capability, crew may elect to auto-land.	<input type="checkbox"/>	<input type="checkbox"/>
8- CONTACT ATC to report laser incident and request priority. If necessary, declare an emergency.	<input type="checkbox"/>	<input type="checkbox"/>
9- Avoid rubbing eyes. And seek medical help when required after landing.	<input type="checkbox"/>	<input type="checkbox"/>
10-ALLOW eyes to regain visual function and check aircraft instruments for any deviations from assigned flight profile when visual function returns.	<input type="checkbox"/>	<input type="checkbox"/>
11-Continue to CROSS CHECK and verify instrument indications for visual legibility during approach and landing.	<input type="checkbox"/>	<input type="checkbox"/>
12-DISENGAGE autopilot and coupler as per company policy	<input type="checkbox"/>	<input type="checkbox"/>
13-Manoeuvre or position the aircraft such that the laser beam no longer illuminates the flight deck. After coordination with ATC.	<input type="checkbox"/>	<input type="checkbox"/>
14- Ask ATC for different runway for landing.	<input type="checkbox"/>	<input type="checkbox"/>
15- Execute missed approach procedures.	<input type="checkbox"/>	<input type="checkbox"/>

Table 6 Proposal for Pilot Laser Checklist

Pilots precautions:

1. Read laser NOTAMS of destination airport.
2. Expect Laser Activity during night operations. Especially during months (January, February, May, June), and hours from (16:00z to 23:59).
3. Expect Laser attacks during approach and Landing Phases and within LFFZ, LCFZ zones.

Chapter 3

TRENDS

3.1 Laser Attacks in MID Region per Year

3.1.1 Laser attacks reported at MID State Per year (Source: IATA)

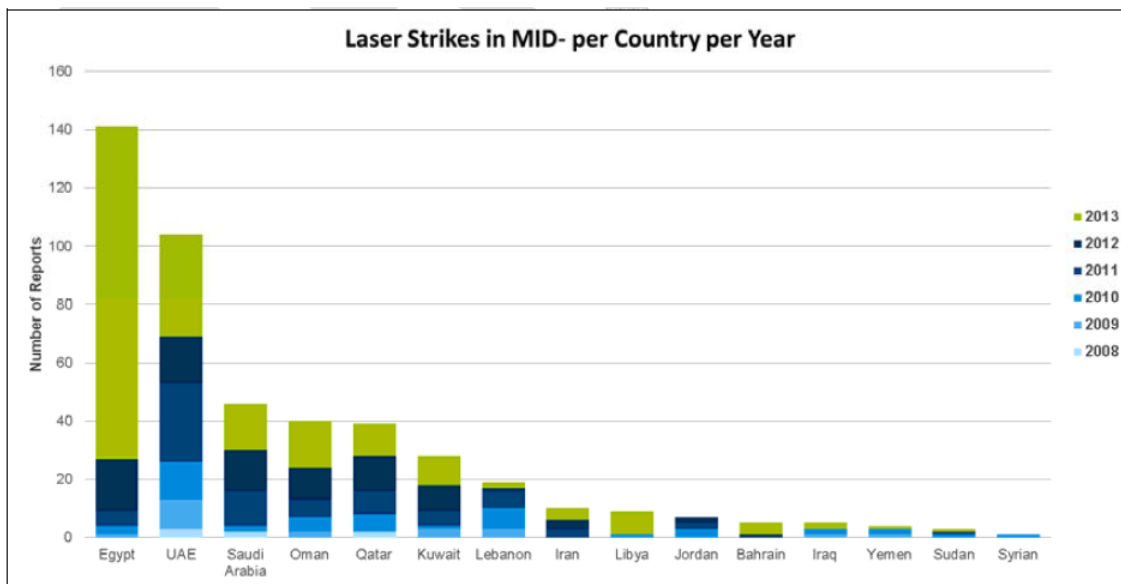


Figure 6: Laser Attacks Reported at MID State per Year (IATA)

No index entries found. 3.1.2 Pie Chart 3 years comparison (Alpha airport):

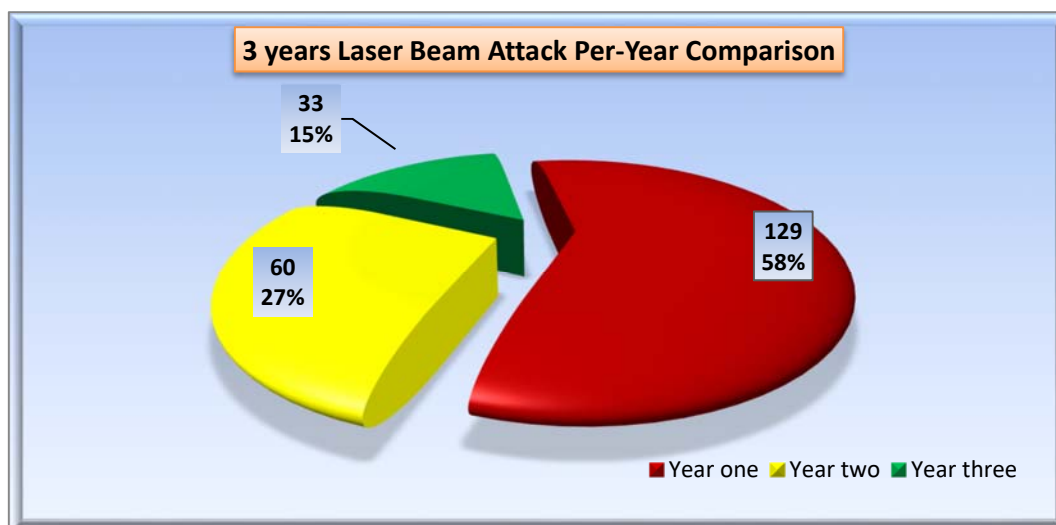


Figure 7: Pie Chart Comparison at Alpha Airport during 3 years

3.1.3 Laser attacks reduced to 15% during 2015 due to several reasons:

- A) Pilots and ATCO awareness.
- B) Few Pilots have PPE, or got proper training, and procedures. Like (KLM).
- C) ICAO meetings and seminars was very useful to highlight the importance of establishing database, etc.....
- D) Foreign airliners switches off exterior lights to avoid spotting by laser attackers (**Stealth mod**). Few pilots requested that from ATCO during final Approaches, although it is against normal procedures.
- E) A number of pilots did not report laser events (*Acceptance of risk as normal*). They think the risk is within accepted level. Moreover, some of them lost hope in solving this problem, In addition, they were attacked by laser for many years, and knew some recovery actions. Some pilots thinks it is a waste of time and effort, or it is not important to report incidents like laser illumination, and a quit number don't have *the safety reporting culture*.
- F) I noticed that during winter (December 2014), when temperature drops sharply and up normally, or during thick fog, we did not receive any reports of laser activity.
- G) Appling ICAO recommendations such as creating LLWG, this was the first step in identifying the risk and to help solving the problem.

3.1.4 Pie Chart during 2 years comparison (Bravo):

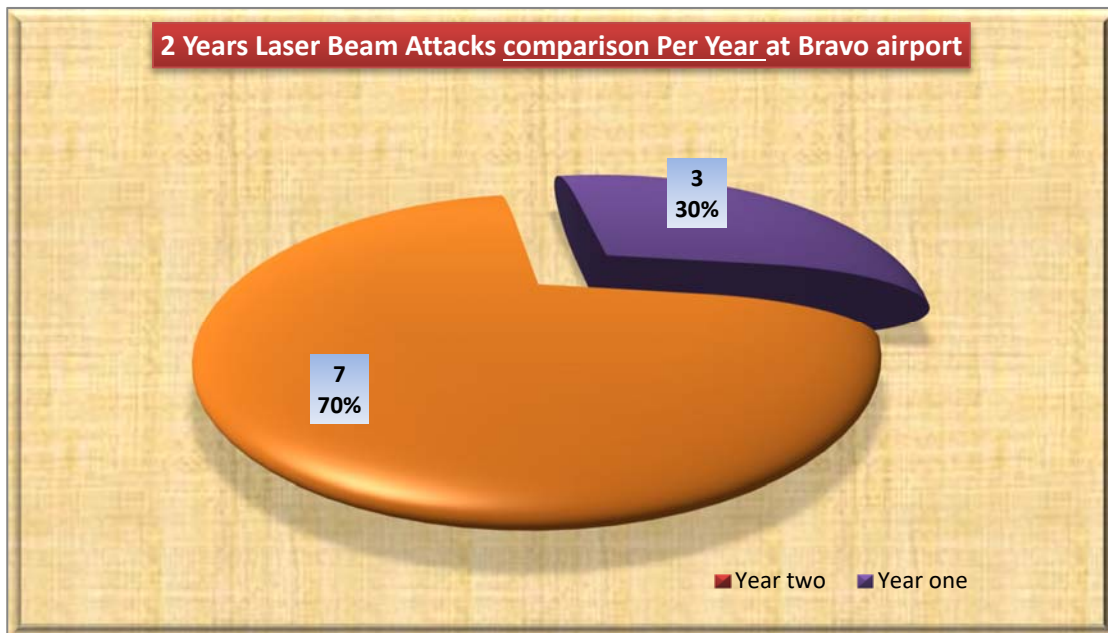


Figure 8: Bravo Laser Attacks Comparison during 2 Years

3.1.5 Pie Chart 2 years comparison (Charlie):

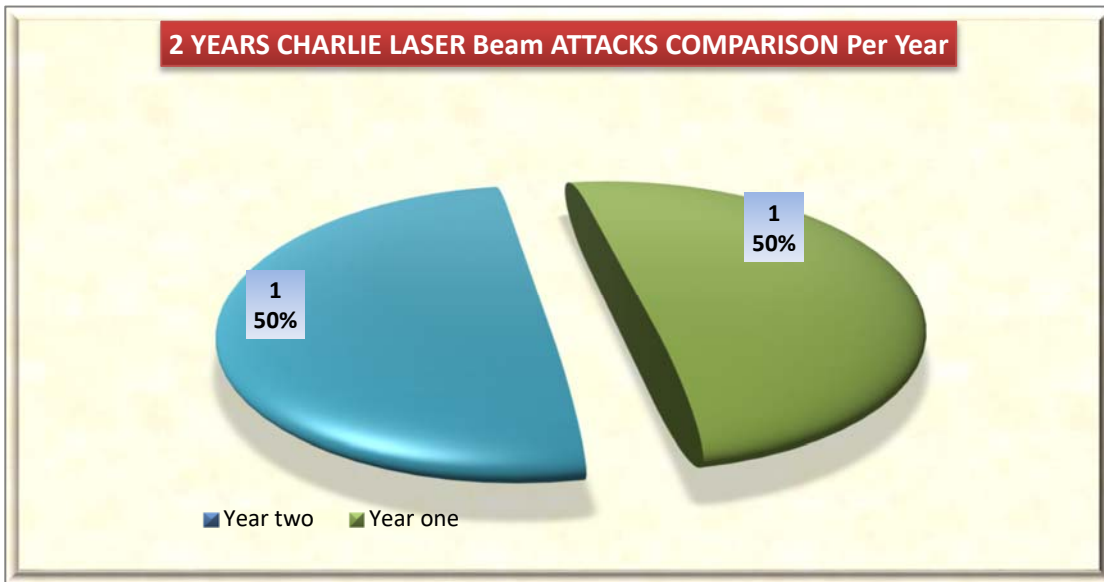


Figure 9: Pie Chart Comparison during 2 Years at Charlie Airport.

3.2 Laser Attacks per Month:

3.2.1 Laser attack incidents (Per Month) reported at Alpha Airport during 2 years.

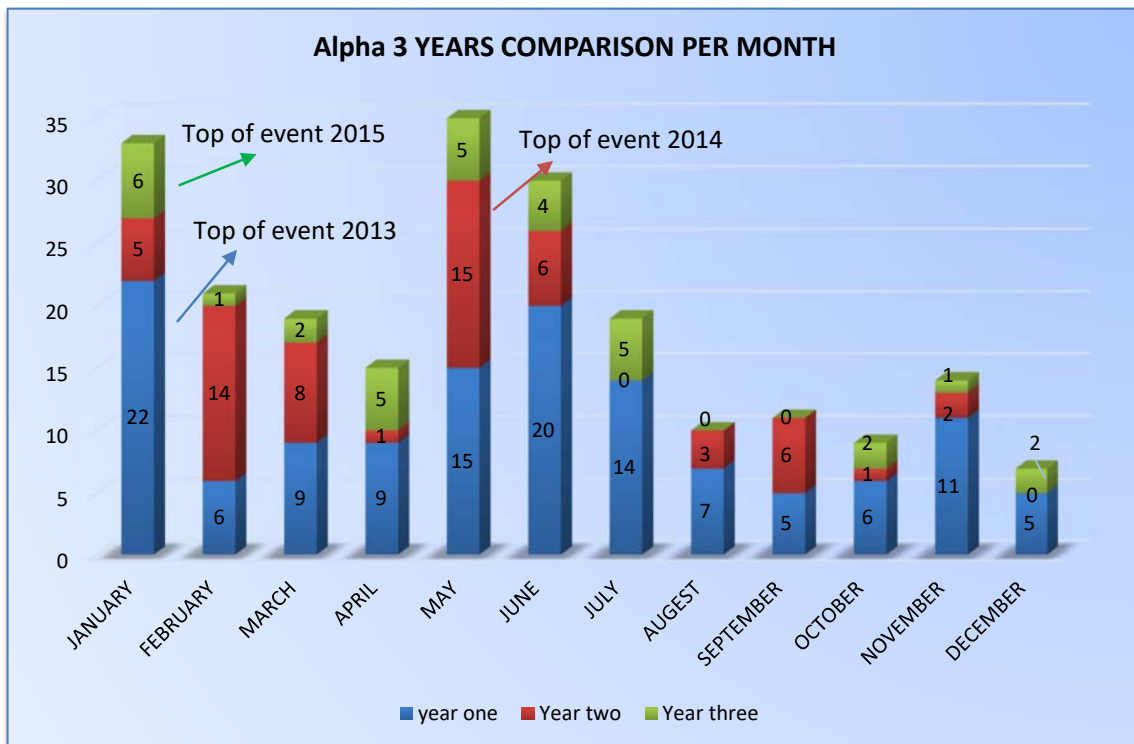


Figure 10: Laser Attacks per Month at Alpha Airport

Top of events are during Official Holidays, summer holidays and National events.

1) Top of event were during January Year one and three, while it were during May year two.

* In my opinion, the numbers may be temporarily reduced, although laser attacks increase every year all over the world.

I think numbers will decrease after applying most of mitigation methods. However laser-beam incident severity will reduce quickly, by using Recovery methods like laser-beam best practices (Pilot/ATC checklists), and training campaigns.

3.2.2 Laser Attacks During Two Years at Bravo/Charlie Airports:

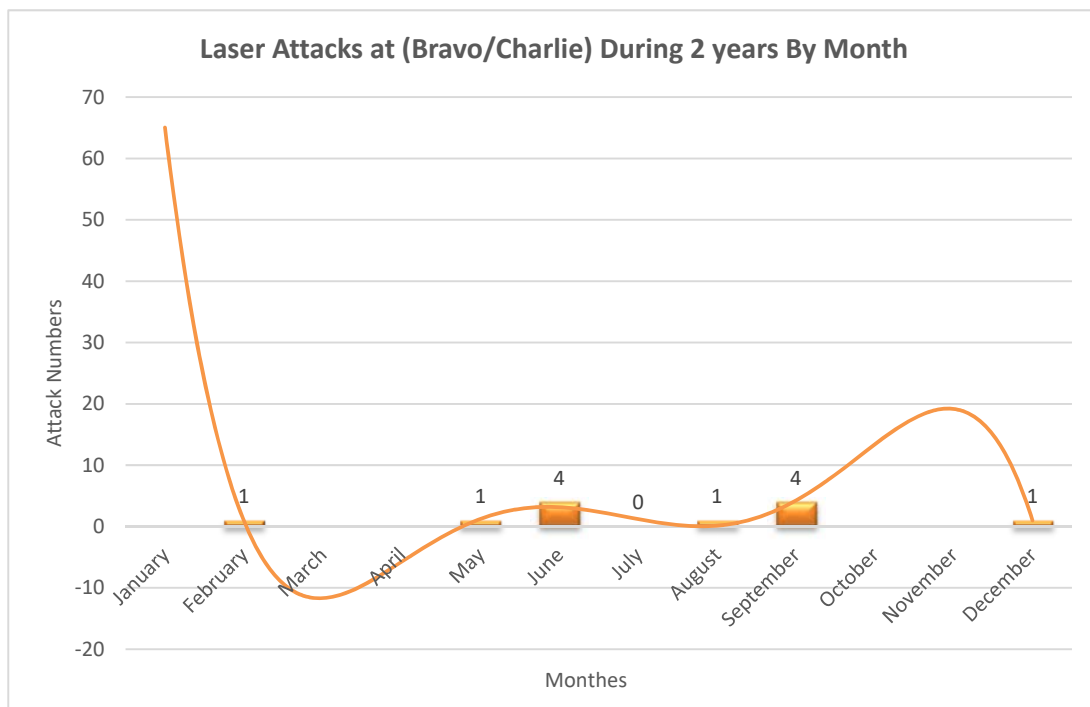


Figure 11: Laser Attacks per Month at Bravo/Charlie during 2 Years

Most of Laser attacks was during summer holidays. Top of events were during June and September.

3.3 Trend per Hour during 3 Years at Alpha airport:

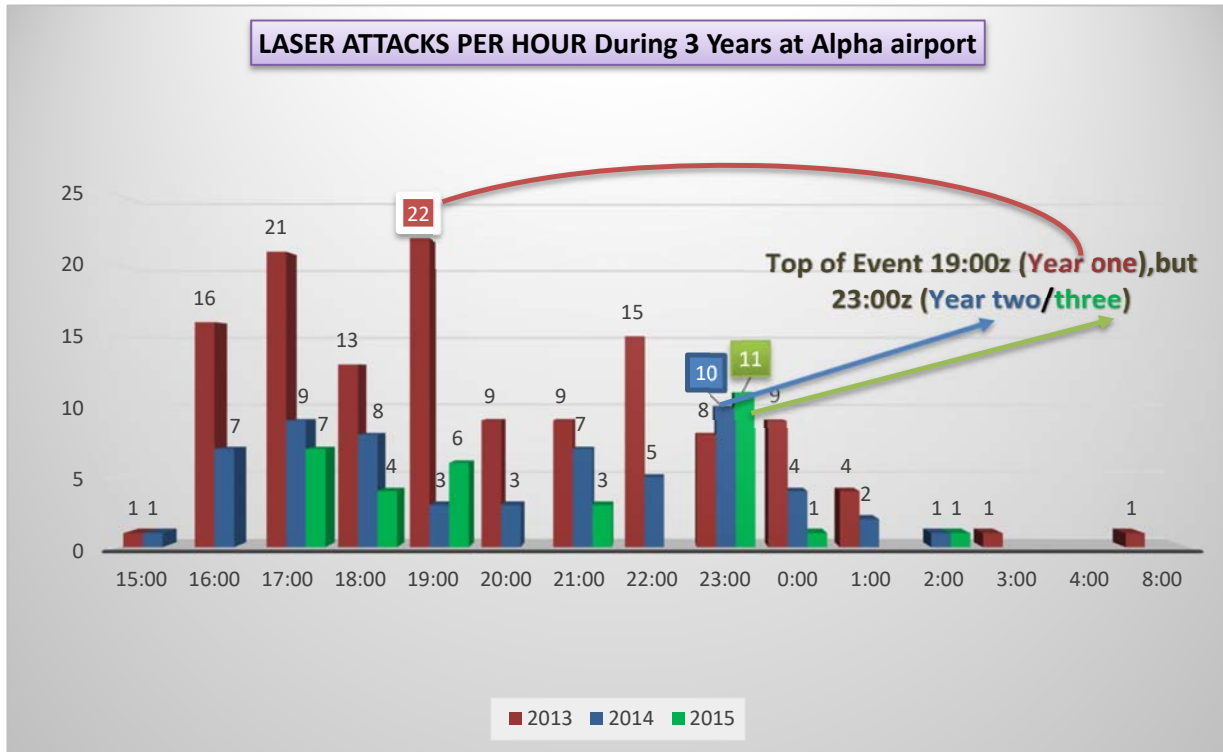


Figure 12: Laser Attacks per Hour at Alpha Airport during 3 Years

- A) Day vs. night: only one report at year one during day light hours, while 229 during night hours in the study period 3 years. Therefore, it is a night event,
- B) In addition, Top of event during year one happens at time: 19:00z, and starts to go down.
- C) Years two and three comparison: event starts at 16:00z almost end at 01:00z. And top of event for both years were 23:00z.
- D) Top of event at Charlie airport 16:21 z and 00:42 z.
- E) Top of event at Bravo airport 18:00 z and 19:50 z.

3.4 Laser illumination in relationship with the established ICAO zones:

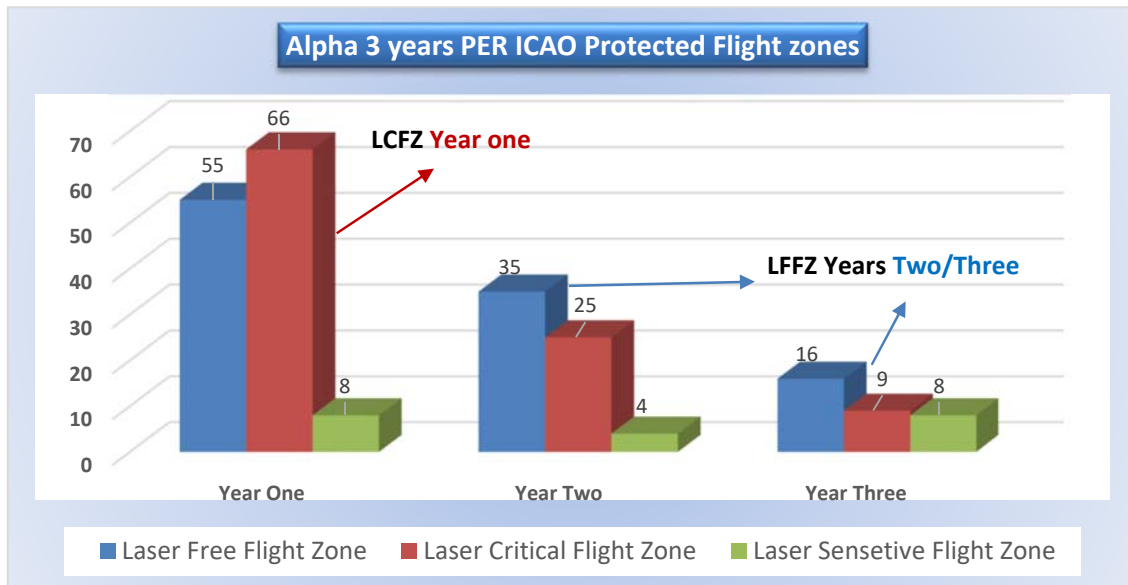


Figure 13: By Laser Protection Zones at Alpha Airport

3.4.1 Trend by ICAO laser Protection zones Alpha airport

- The dimensions are actual. Most attacks are in laser beam free flight zone 48% and laser critical flight zone 47%(during Year One).and as well 55% and 39% respectively during Year Two. And LFFZ was 48% and LCFZ was 27% during Year Three.
- Critical flight phases are within Laser Beam Free Flight Zone.
- LFFZ should have the priority when applying mitigation methods, Then LCFZ.
- The majority of attacks are in first two zones. LFFZ were 47%, LCFZ were 44% and LSFZ were 9 % during 3 Years. Therefore, we should concentrate our efforts on the Free flight zone, for getting fast results, achieving ALS and Implement effective methods for this specific area, by establishing layers of defence. And recovery plane for all stakeholders. Probability decreases in year two and three, but percentage increases at free flight zone.

3.5 Laser Attacks per Flight Phase:

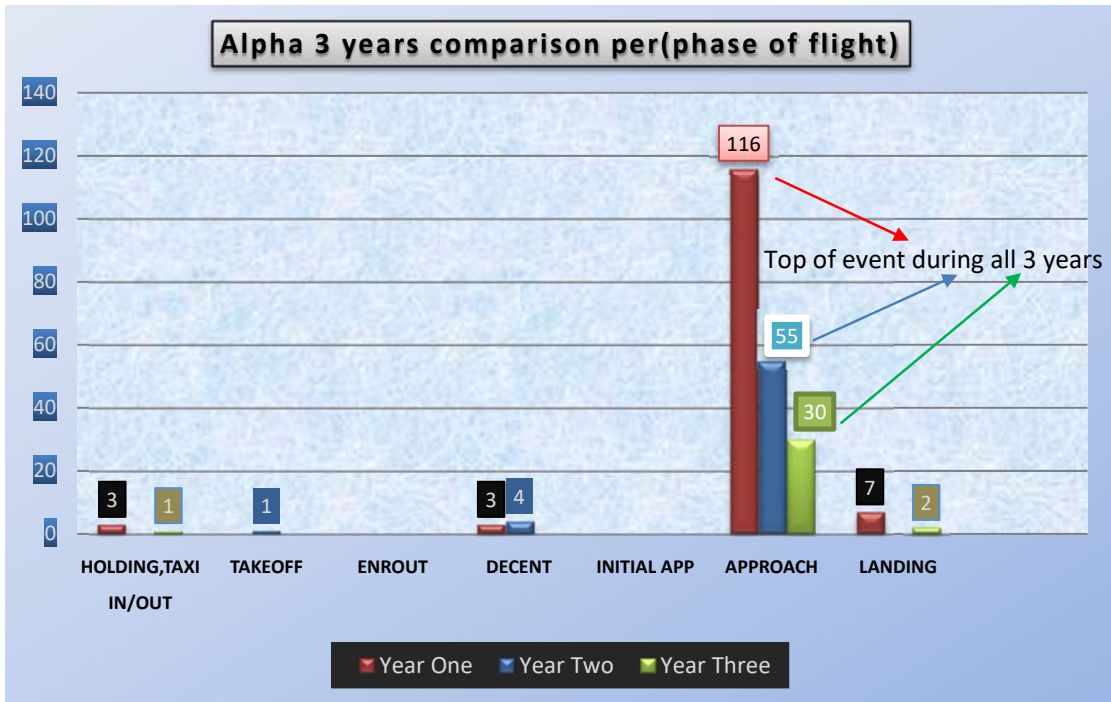


Figure 14: Flight Phase Comparison at Alpha Airport during 3 years

90.50%, of laser illumination occurred during approach, 4% during landing, and 3% during descent and 2% during holding and taxi, 0.5% during take-off. With 3 laser beam attacks on the tower cabin. There are no attacks during any other flight phases during study time 2013-2015.

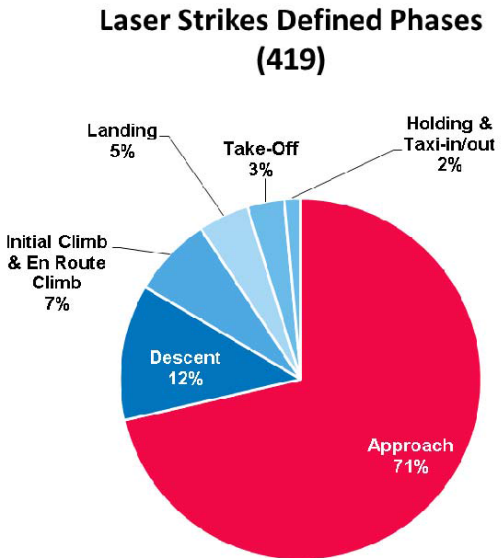


Figure 15: Laser Attacks per Flight Phase (Source IATA)

3.6 Trend for Laser Colour and Visual Effects:

A green laser is more of a visual hazard than an equivalent red or blue laser. Green laser presents 39% and Blue 1%, Unknown colour 50%, Dazzling light 6.5%, fireworks 1.5%, and attacks on Tower cabin with green laser 2%.

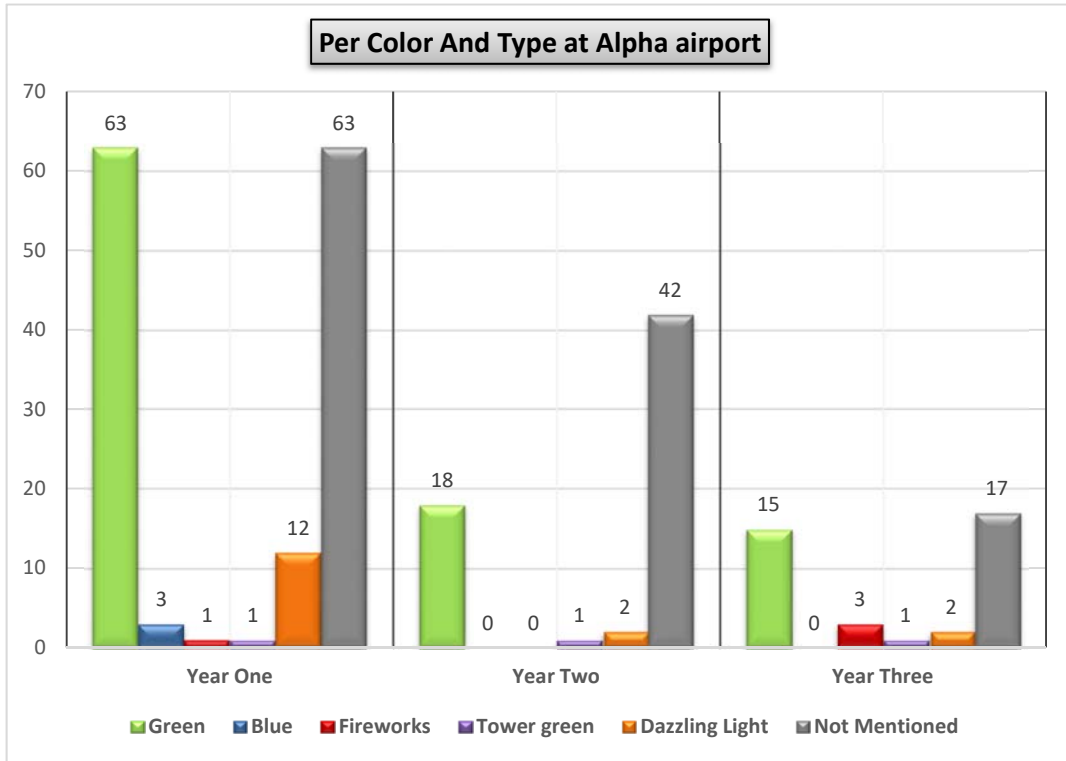


Figure 16: Laser Attacks per Color and Type at Alpha airport

3.6.1 Visual Effects and Hazard Distance by Colour:

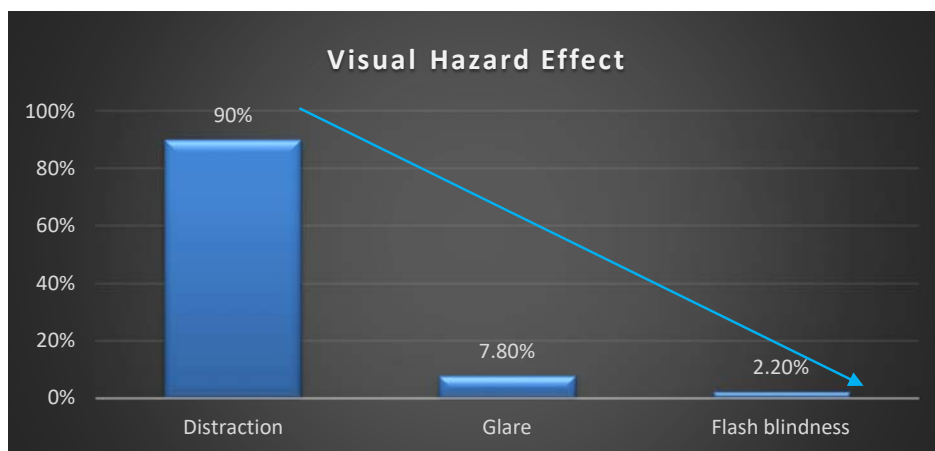


Figure 17: Visual Hazard Effect

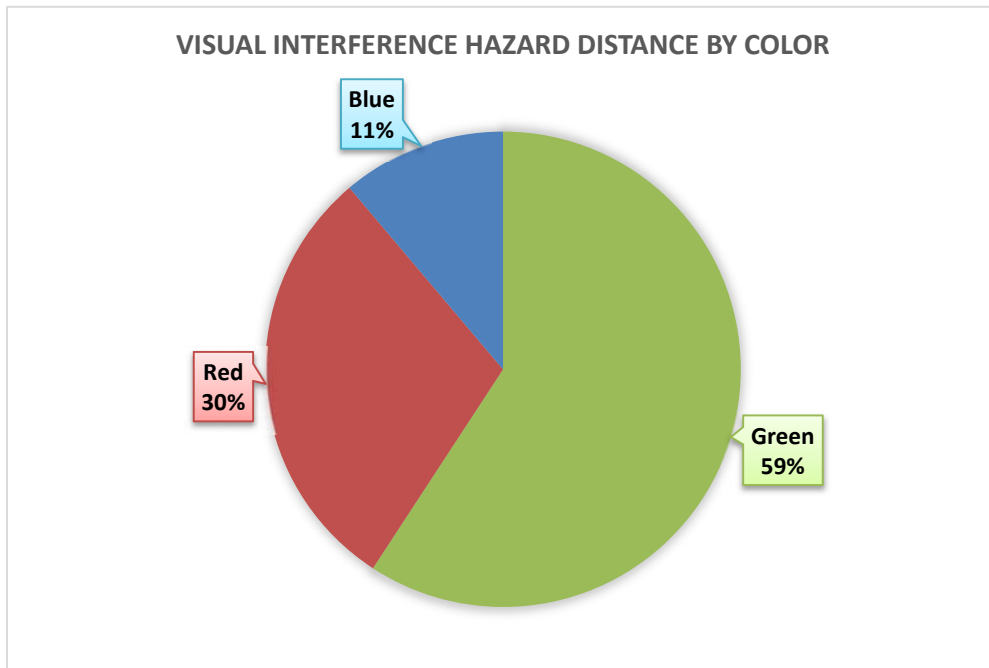


Figure 18: Visual Interference Hazard Distance by Color

The most common colour is the green colour, green has the longest visual interference hazard distance. With the great visual effects on pilot eyes, causing maximum distraction or glare or flash blindness.

3.7 CAA Control Methods:

CAA Shall control the ground bases responsible for laser night shows like clubs and ceremonies:

- 1- Having prior clearance.
- 2- Controlling laser beam directions (vertically and horizontally in degrees) to be away from runways centerlines extension.
- 3- Increasing diversion and output power or pulse energy of the beam to reduce visual hazard.
- 4- Terminating beams to protect critical airspace.

CHAPTER 4

Applying ICAO protection zones dimensions on airport chart.

4.1 PLOTTING THE LFFZ, LCFZ, AND LSFZ AT ALPHA AIRPORT WITH AUTOCAD.

protected flight zones

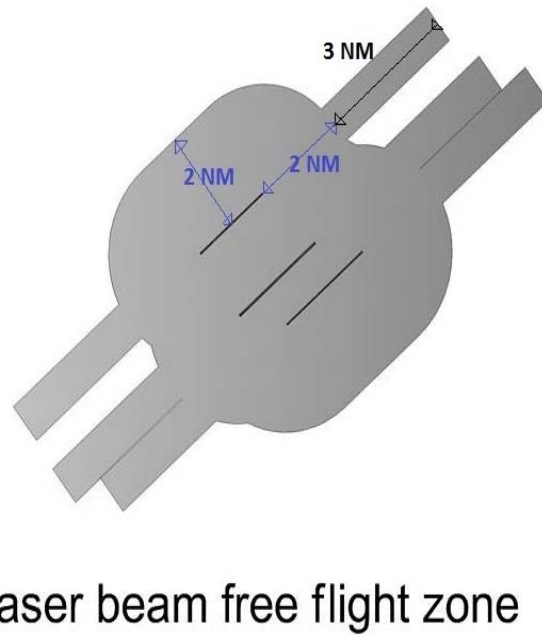
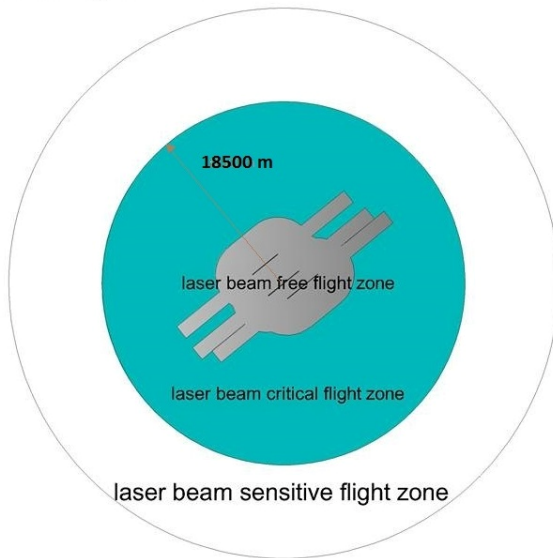


Figure 19: AUTOCAD Plotting the LFFZ, LCFZ and LSFZ Chart at Alpha Airport

Figure 20: LFFZ (Laser Free Flight Zone) Chart at Alpha Airport

4.2 publish new chart in national AIP

CHAPTER 5 COORDINATION

5.1. MANAGEMENT COORDINATION

- 1- Aerodrome managers.
- 2- Air traffic managers.
- 3- Local police organizations.

5.2. LOCAL LASER WORKING GROUP (LLWG)

- Already Done by CAA, and This Study is a Product of Several Meetings during the last three years.
- A guidance material is provided parallel to this study.

Chapter 6

MITIGATION MEASURES:

A) Long term:

TECHNOLOGY:

- Aircraft manufactures should design new aircraft wind shield with new technology, to be reflection curved surface or diffuse reflection.

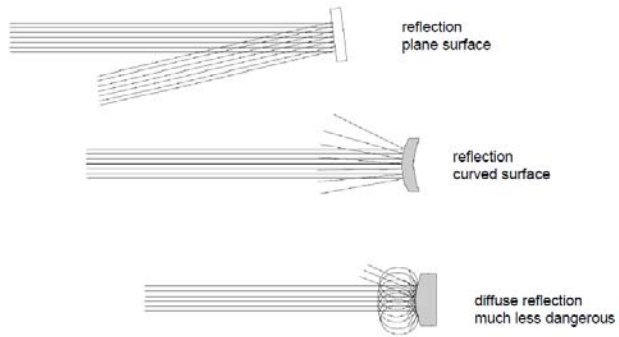


Figure 21: Proposed Reflected Wind Shield Design

PROCEDURES:

- **Curricula in schools** about the seriousness of the laser.
- Trade association: **Laser labeling:** manufacture voluntarily adds aircraft safety labels. , a warning statement or sheet.

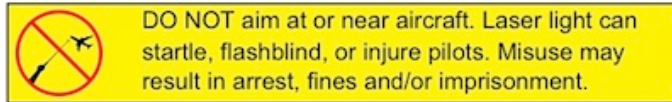


Figure 22: Laser Labeling

- **Stronger laws**, jail, for any one intentionally aiming at aircraft.
- **User education.** Via laser sellers' websites, manuals.
- **License** for outdoor laser activities, SOS...
- **Taxes:** Tax on consumer laser power. Tax laser pointers and handheld lasers at a rate significant enough to discourage casual purchases by the public, without making them unaffordable for persons who might need or want a laser for work or useful personal purposes. *It May be applied in future.*



Figure 23: User Education Manual

- **Ban sales of Class 4 consumer lasers.**

B) Medium term:

Technology:

- **Emergency phone number** for reporting to local police department.
- Airbus invented a test windscreen anti-laser film for most common type of laser pointer, up to 2 m watts.

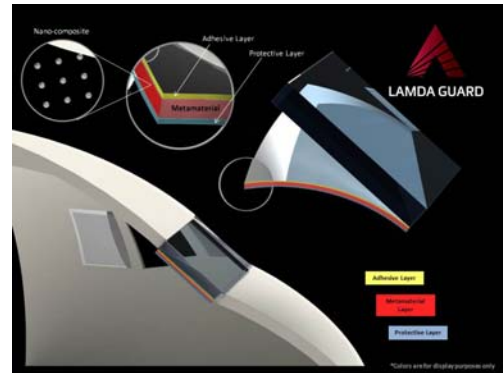


Figure 24: Anti-Laser Film (Nano Technology)

Procedures:

- **Laws restricting sale** and/or possession of consumer handheld lasers above a specified power level.

Training:

- **Pilots training.** FAA studies in a 737 simulator have shown that pilots often have trouble during their first exposure to laser light while simulating a tricky "short final" approach. However, success rates improve markedly after the second or third exposure. The pilots now know what to expect, and how to react. ***Pilots are the "last line of defence".***



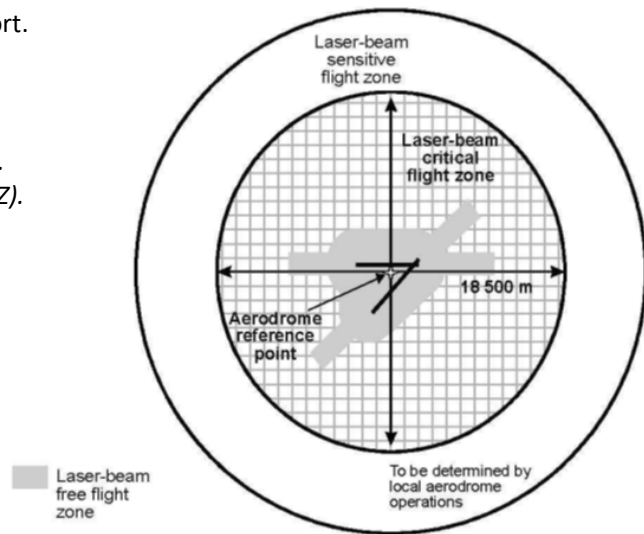
Figure 25: Simulation Training for Pilots

- **ATC training.**
- Undertake safety promotion activities to increase awareness and reporting.
- Public Awareness campaigns.

C) Short term:

Procedures:

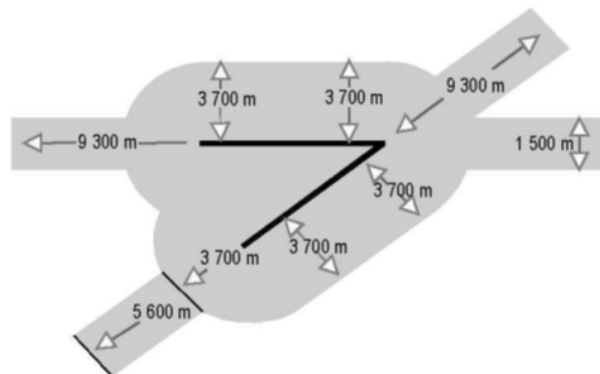
- Newspapers and Media coverage of hazards, prohibitions.
- The extensive presence of police in specific places, for most of the attacks for rapid intervention.
- Laser warning Signs around the airport.
- Protection zones around the airport:
 1. *Laser-beam free flight zone (LFFZ).*
 2. *Laser-beam critical flight zone (LCFZ).*
 3. *Laser-beam sensitive flight zone (LSFZ).*



Note.— The dimensions indicated are given as guidance only.

Figure 26: ICAO Protected Flight Zones

1. *Laser-beam free flight zone (LFFZ).*



Note.— The dimensions indicated are given as guidance only.

Figure 27: ICAO Laser Free Flight Zone (LFFZ) Dimensions

Technology:

- Make website for **pilots' reports** .to register reports at it.
- Send information to the **Civil Aviation Authority** via email to (email).
- Create a **mobile application** for (pilots and public) connected with **CAA website**. Enables them to report an event or request clearances for laser activity (clubs...).
- **Pilot goggles.**
Red goggles protects from blue and green laser beam. The other one protects from red laser beam.



Figure 28: Pilot Protection Goggles

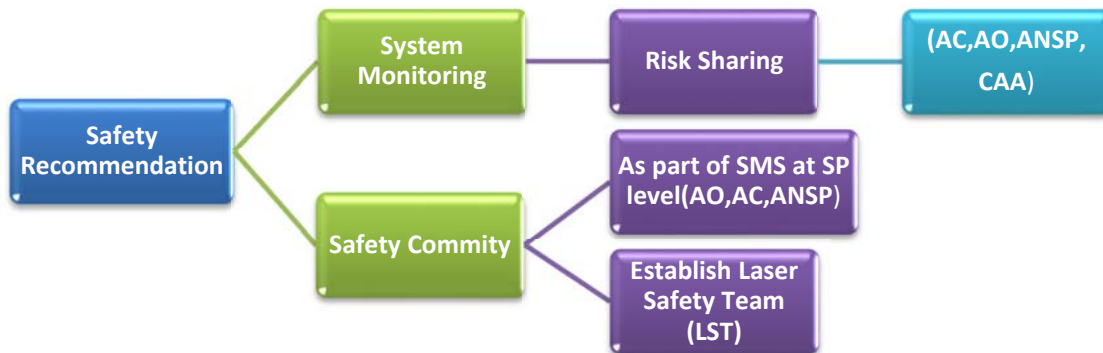
Precautions:

- Training for pilots shall include goggles manual.
- Never use goggles for the wrong laser!

Training:

- Public awareness campaign. (This technique can solve many aviation issues related to public (like FOD/Bird strike/Laser), by Applying it in the vicinity or airports at free flight zone only). It will achieve very good results in a very short time, by applying 1 to 2 minutes in every speech every week or month) (CAA should make awareness campaigns to get effective and fast results. and this solution will save more money in future.
- Using checklists to reduce the laser-beam incident severity and probability. For pilots and ATCO'S.

SAFETY RECOMMENDATION



- Start a Combined Training Campaigns for Pilots and Awareness Campaigns for ATCOs.
- Apply ICAO Protective Zones. And publish it in AIP.
- Survey for all aircraft operator to assess their capabilities (Procedures or checklists, Training, Safety reporting culture and Laser incidents record), and to provide further information.
- Assess the capability of the affected ATC facilities.
- Establish Database for system monitoring for national level (airports).
- Enhance the reporting mechanisms/systems at national level.
- Continues determination of contributing factors and root causes, in order to support the development of mitigation measures.
- Arranging coordination as soon as possible between all stakeholders.
- Insert ICAO Protective Zones (as a part of safeguarding) into future airports plans, and to be a part of airport certification. Before building any future airports.
- Issue annual NOTAMS for affected airports includes information about time, location and any available information about laser events.

CONCLUSION

Laser illumination is a safety and security concern. The annual percentage of laser illumination per all year traffic was less than 0.1%. We can reduce probability and severity of laser by different measures. Applying ICAO recommendation by establishing database helped us to identify hazard and to know how to control it. But after deep analysis, Gap analysis indicates that pilots are bias in reporting system. Moreover, I found that the results of risk assessment indicates the true size of the problem, if we managed to mitigate the tolerable incident reports, which were 99% of all incidents, and control the remaining by control measures and system monitoring, then we finally can reach Acceptable Level of Safety ALS. Pilots/ATCOs should have proper training including (visual effects, situational factors, operational factors, the impact on aircrew, and the main sources of laser, causal factors, how to recover and how to use best practices/checklists...).

Deep analysis enabled us to achieve fast results, Laser beam reported incidents were reduced by approximately 70% annually during the study period at Alpha airport. Top of event at Alpha airport happened during January and May at days Monday and Thursday at hours 19:00 Z, and 23:00 Z. The approach flight phase was the most affected phase of flight, it was more than 90%, and my results confirms IATA results in annual safety report 2014. Laser free flight zone (LFFZ) was the most affected zone after plotting incidents inside, which was approximately 50% of total incidents, we should start mitigating the LFFZ first to ensure safety and to get fast results. Green laser has the greatest visual effect, moreover, approximately 45% of reported incidents were green laser beam. The results of Applying laser beam incidents on google earth, were the concentration areas of laser beam attackers, thus, we can place police intervention around these places during top of event times. That is how we act proactively in the future, so that the hazard is recognized and addressed before it could turn into an occurrence.

Finally, the most effective control methods was ATC/Pilot checklists. And eventually, start phase three, to provide guidance materials. Moreover, phase four, to start a training campaign. Furthermore, phase five, audit by CAA. Furthermore, monitor the system, renew database and renew root cause analysis to support and develop new mitigation measures or corrective action plan if required.

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APPENDIX D

DIP Tracking for MID-RAST/RGS/6

Laser Attacks

RGS/6 DIP Deliverable	Target Date	Status	Comments
RSA for Guidance Material	September 2016	Completed	Draft RASG-MID Safety Advisory (RSA-12) was reviewed by RGS WG/3 and was circulated to States on 29 March 2017 (Ref: ME 4-17/067).
Amended RSA-12	September 2017	Completed	Draft Amended RSA-12 has been prepared and is included as part of RASG-MID6 - WP/11 pending endorsement for publication
✓ ICAO to issue State Letter to promulgate regulations on Laser Attacks	June 2015	Completed	Letter issued by ICAO MID on 3 September 2015.
RSA with Case Studies	May 2017	In Progress	Draft has being prepared to be reviewed by RGS/4 Meeting by November 2017 before circulation to States

APPENDIX E

Safeguarding Regulatory System

Toolkit

MID-Region Aerodrome Safeguarding Toolkit

Attachment A

These guidelines are developed by the Runway and Ground Safety Working Group (RGS WG), as part of MID-RAST/RGS/3 DIP deliverables, based on the work of the Egyptian Civil Aviation Authority in collaboration with the ICAO MID Regional Office within the framework of RASG-MID the Regional Aviation Safety Group - Middle East (RASG-MID).

Disclaimer

This document is intended to provide guidance for civil aviation regulators, aerodrome operators and other stakeholders involved in aerodromes infrastructure and maintenance.

The document has been compiled by members of the aviation industry to enhance aviation safety. It is not intended to supersede or replace existing materials produced by the State or in ICAO SARPs. The distribution or publication of this document does not prejudice the State's ability to enforce existing National regulations. To the extent of any inconsistency between this document and the National/International regulations, standards, recommendations or advisory publications, the content of the National/International regulations, standards, recommendations and advisory publications shall prevail.

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ADVICE NOTE 1

INTRODUCTION

1. BACKGROUND

1.1 Safeguarding has been identified by the MID Region Annual Safety Report Team (RAST) as one of three main risk areas (Focus Areas) to be addressed under the MID Region Aviation Safety Group (RASG-MID) framework.

1.2 The MID-RAST RGS has undertaken a Safety Enhancement Initiative (SEI) to develop guidance material and training programs to support creation of action plans for Safeguarding.

1.3 The Detailed Implementation Plan (DIP) for the SEI included the action to develop and issue regulatory framework supporting establishment of Safeguarding teams.

2. PURPOSE

The purpose of this circular is to propose a regulatory framework to support the creation and success of a national Safeguarding System supported by the following elements:

(Chapter 1)

1- **Primary Regulations** to be included in the national regulations that are relevant to Safeguarding stakeholders who hold primary responsibility for Safeguarding of aerodromes. Ministerial decrees that may have been or are to be issued to promote aerodrome safeguarding (e.g. providing for coordination between Aviation and local planning authorities, establishment of a national aerodrome safeguarding committee, establishment of aerodrome safeguarding areas underlying the OLS, PANS-OPS, OAS surfaces and other critical areas that must be safeguarded so as to ensure safe operations of aircraft and national aerodromes) are to be also included. In the model framework this has been identified as the Civil Aviation Authority and Aerodrome Operator,

(Chapter 2)

2- **Supporting Regulations** to be included in the national regulations relevant to other Authorities who have not been identified as primarily responsible for safeguarding of aerodromes.

(Chapter 3)

3- **Guidance Material** to be developed in support of the regulations and to provide details regarding the conduct of the Safeguarding entity. This is to be considered in conjunction with ICAO annex 14 and related documents as well as PANS-OPS and related documents.

(Chapter 4)

4- **Oversight Material** to be developed and added to the existing safety oversight procedures of national regulators. This material can also be used by the Safeguarding stakeholders for their internal safety assurance processes.

USING THIS CIRCULAR

The Table of Contents provides key points of the regulatory framework supporting the creation of a nation aerodrome Safeguarding management system.

The reader will go through the steps of building its own safeguarding management system and could make any changes to any part the way it suite their needs and assure the implementation of acceptable level of aerodrome safeguarding.

This circular as it serves to further empower national authorities in their efforts to support establishment of Safeguarding system through model national regulation, guidance materials.

DRAFT

Chapter 1

PRIMARY REGULATION

1.1 Application

It is recommended the below model regulation be included in the national regulation relevant to the stakeholder primarily responsible for aerodrome safeguarding in order to support the development of a national aerodrome safeguarding management system. In this example those stakeholder are the CAA and Aerodrome Operator.

The regulation is high level, noting it is aligned with aerodrome certification and safety management system principles. The regulation also provides a positive requirement for the CAA and aerodrome operator to ensure participation of all relevant stakeholders

1.2 Model Regulation

Aerodrome Safeguarding Management System

1.2.1 The ECAA Should:

- 1.2.1.1 Ensure that rights are established in the national law and relevant regulations, for Safeguarding of all aerodromes according to ICAO requirements including control of human activity within safeguarding areas, with definition of the word human activities (construction; lights; material used; change of land use; laser;) and clear statement on the Local Planning Authorities' mandatory duty to report any existing and proposed human activity within aerodrome safeguarding areas to the CAA for assessment;
- 1.2.1.2 Review and endorse:
 - Safeguarding requirements for each aerodrome and,
 - Safeguarding management system that has been put in place by the aerodrome operator;
- 1.2.1.3 Audit aerodromes operators to ensure efficient implementation of the aerodrome safeguarding management system;
- 1.2.1.4 Carry out safeguarding regular inspections;
- 1.2.1.5 Ensure that CAA safeguarding personnel are invested with judicial officer's right to access to such places as may be necessary to carry out the safeguarding inspections and audits and testing;
- 1.2.1.6 Define the entities invested with the power to impose the national law penalties in the event of detection of aerodrome safeguarding violations

1.2.2 The Aerodrome Operator should:

- 1.2.2.1 Establish safeguarding management system acceptable to CAA that, as a minimum complies with the requirements of the national safeguarding regulation and includes requirements such as:
 - a. Establishment of safe guarding team with clear organizational structure;
 - b. Establishment of obstacles' monitoring system and procedures.
 - c. Ways of identifying obstacle and Dealing with them
 - d. Procedures and documentations needed to contact CAA for assessment of new development around aerodromes; and
 - e. Land use roles and restrictions.
 - f. Terrain and obstacles data collection, according to QMS

- 1.2.2.2 Comply with the requirements stipulated in the CAA National Regulations and related laws regarding Safeguarding;
- 1.2.2.3 Establish, lead and implement Safeguarding requirement to promote safety and the exchange of safety-relevant information; and
 - Put in place Safeguarding monitoring system, and procedures for implementation
 - Require the organisations operating or providing services at the aerodrome to be involved in such system.

1.2.3 Supporting Ministerial Decree(s) should include:

- 1.2.3.1 Definitions/ description and purpose of OLS and other protection surfaces which define distances and slopes needed for Runway, Radar and Navigation Aids in addition to any other restriction needed.
- 1.2.3.2 Establishment of Safeguarding committee. The Committee shall convene regularly, identify and review national aerodrome safeguarding issues, review and decide on permit applications referred thereto concerning existing or proposed constructions located within the areas underlying the aerodrome safeguarding areas, examine possible solutions and needs for action. Minutes of such meetings, should be kept for reference and information as required.
- 1.2.3.3 Recommended Composition of the National Safeguarding Committee includes, but not limited to, representatives of:
 - a. Civil Aviation Authority
 - b. Aerodrome Operator;
 - c. Radar and Air Navigation Service Providers (ILS, VOR, MICOWAVE....);
 - d. Operational representative; and
 - e. Other Stakeholders as needed.

It is also recommended to include the herein below listed provisions in the Primary regulation provisions related to the following:

- a. Definitions Obstacle Limitation Surfaces Obstacle Limitation Requirements
- b. Terrain and Obstacle Data Collection
- c. Obstacles Restriction and Removal
- d. Inspection
- e. Assessment
- f. Exemption
- g. Shielding Principle
- h. Objects outside OLS
- i. Other Objects
- j. Land Use Hazard
- k. Enforcement

CHAPTER 2

SUPPORTING REGULATION

2.1 Application

- 2.1.1 It is recommended the following model regulation be included in the national regulation relevant to the stakeholder who are critical to the success of the Safeguarding Management system, but are not primarily responsible for the establishment of the system.
- 2.1.2 The critical stakeholders are:
- a. Local Planning Authority
 - b. Any land Owner (personnel or organization)
 - c. Communication and Advertising Companies

4.3 Model Regulation

- 2.2.1 **Local Planning Authority (Housing Law) should:**
- a. Ensure that issued building permits for constructions within the aerodrome safeguarding areas do not have adverse impacts on safety of aircraft operation;
 - b. Ensure that safeguarding violations are removed or reduced as monitored.
 - c. Effect continuous coordination with Civil Aviation Authorities before any:
 - change of Land Use
 - planning of new Urban areas
 - d. Ensure that the property owner shall be responsible compliance with the maximum d height and other conditions, if any, stipulated in the Aviation permit issued, using the right tools of measurements.
- 2.2.2 **Land owners (personnel or organizations) should:**
- a. Notify CAA, sufficiently in advance, prior to commencement of any procedures for type of development on their land if such is located in the vicinity of an aerodrome. The said notification should include, inter alia, detailed particulars of the land (boundaries, elevation of highest point) and details of the proposed development.
 - b. Comply with CAA's conditions or restrictions on the proposed development, if any.
- 2.2.3 **Communication and Advertising Companies should:**
- a. Notify CAA, sufficiently in advance, prior to commencement of any procedures for carrying out any installations within areas underlying the aerodrome safeguarding protection surfaces. The said notification should include, inter alia, detailed particulars of the proposed installation, as appropriate (e.g. location, elevation of highest point, frequencies etc.).
 - b. Comply with CAA's conditions or restrictions on the proposed installation, if any.

Chapter 3

GUIDANCE MATERIAL

3.1 Application

The following guidance is recommended to be adopted to support the model regulation for the aerodrome safeguarding stakeholder. In this example that stakeholder is the Aerodrome Operator.

3.2 Model Guidance for Aerodrome Safeguarding Management System

Aerodrome Safeguarding Management System

3.2.1 The Aerodrome Operator should:

- a. Develop charts of the OLS, PANS OPS and other protection surfaces within and outside the aerodrome on charts as per ICAO requirements (national regulation requirements) and seek endorsement thereof by CAA;
- b. Coordinate with Local Planning Authority and other authorities to improve safety outside aerodrome;
- c. Establish an adequately staffed and equipped aerodrome safeguarding entity;
- d. Organize, coordinate and implement aerodrome safeguarding programs to ensure protection of the airspace essential to the safe operation of aircraft at and around the aerodrome.
- e. Coordinate and promote the exchange of information and the joint inspections of areas underlying the aerodrome safeguarding surface, with the aerodrome safety management team as well as businesses and communities in the vicinity of the aerodrome as appropriate;
- f. Ensure the aerodrome safeguarding entity is supported by a Policy and Procedures manual including clear details of the organizational structure, job descriptions, procedures for inspection, reporting of inspection results, dealing with existing and potential obstructions etc.
- g. Identify existing removable and non-removable obstacles at the aerodrome and outside the aerodrome (location, height, nature and use), and undertake the mandatory reporting actions, as appropriate;
- h. Implement suitable strategies and procedures to remove hazardous obstacles or when this is not immediately possible, to undertake the necessary actions to manage and mitigate the risk, including publication Aeronautical Information Publication.

Note: The criteria used to establish and chart the several types of the aerodrome safeguarding surfaces are contained in ICAO Annex 14, ICAO PANS OPS document ICAO Annex 4 — Aeronautical Charts, and related documents thereof.

3.2.2 CAA should :

- a) Establish and implement national safeguarding system to promote safety inside or outside all aerodromes; which include but not limited to:
 1. Develop the Aviation law and regulations of safeguarding foundation and enforcement according to ICAO annex 14 and related documentations and State rules.
 2. Assign Safeguarding team/division in charge of safeguarding and auditing of the aerodromes.
 3. Support technical and audit operator's safeguarding team/departments.

4. Review and approve aerodromes' OLS maps according to national regulations.
 5. Have Obstacles assessment system policy and procedures.
- b) Arrange with Local Planning Authority, concerned ministries and all other parties on aerodrome safeguarding as follows:
1. Provide formal notifications of safeguarding protection area on maps for each aerodrome to the relevant Local Planning Authority.
 2. Review all urban future development within State level .to ensure that none may adversely affect aerodrome future development.
 3. Review and approve different land use locations (industrial, commercial in addition to any wind-farms, electricity poles, communication antennas and advertising high masts).
 4. Review all new roads and bridges including light poles and traffic patterns in area adjacent to aerodromes.
 5. Other information as may be necessary, for example, landscaping details to enable the birdstrike potential to be assessed, or the types of cladding materials proposed so that the potential for radar reflection can be modeled.
 6. As part of the Aerodrome Certificate, CAA has to review/ accept all Obstacles data and the relevant aeronautical studies and make sure that publication in the AIP is made as per the relevant regulations.
 7. Audit and support operator's safeguarding Monitoring system to take necessary actions when needed.
 8. Taking all measures to ensure that obstacles are removed, lowered, marked or lit.
 9. Apply law enforcement in case of violations.
 10. liaise with appropriate planning authorities and companies that erect tall structures, to determine potential infringements. Every effort should be made to implement the OLS standards and limit the introduction of new obstacles. However, when a new obstacle is detected, the aerodrome operator must ensure that the information is passed on to pilots, through NOTAM, in accordance with the standards for aerodrome reporting procedures set out in the relevant regulations.

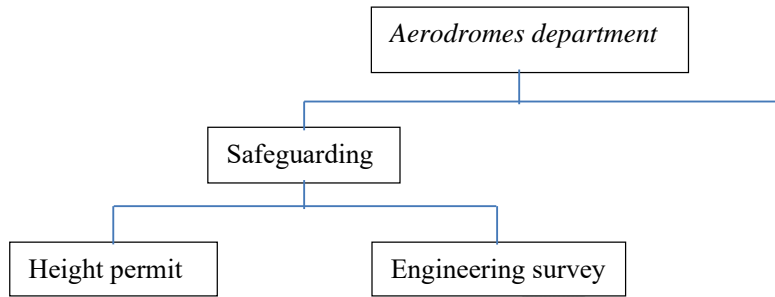
3.2.3 Aerodrome Safeguarding Division should:

Have Specialized training to ensure:

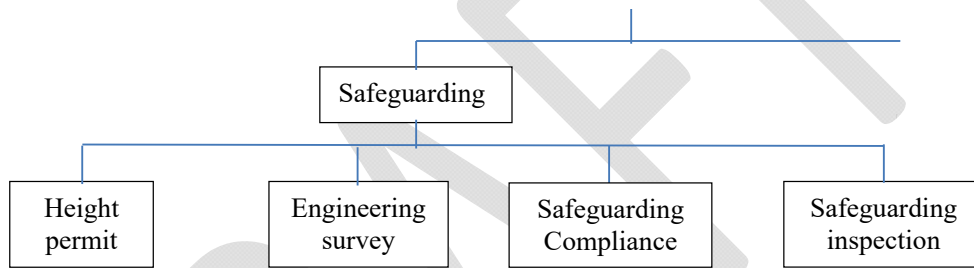
- a) Understanding safeguarding management and obstacles assessment.
- b) Familiarization of safeguarding duties; responsibilities and data collection.
- c) Good use of safeguarding tools.
- d) Accurate obstacle data collection and reporting.
- e) Put in place and implement an effective plan for monitoring including contingency monitor.
- f) Development and implementation of safeguarding filing system.
- g) Detection of changes in the obstacle environment, marking and lighting and in human activities or land use on the aerodrome and the areas around the aerodrome, as defined in coordination with the competent authority.
- h) Take the necessary actions to report to the procedure any changes of the status of the existing critical obstacles and any proposed development that is likely to be higher than the critical obstacles within the area depicted by the procedure designer.

- i) Immediately report to CAA any violation or potential obstacle or new buildings, navigation aid equipment's or changes of use to any building within the aerodrome fence.
- j) Conduct an obstacle survey by competent surveyor to establish the initial coordinates and details of obstacles and conduct periodic surveys thereafter.
- k) Ensure that the runway and taxiway strip areas are free from obstacles or objects which are considered hazardous to aircraft operations unless required to be there for air navigation purposes.
- l) Mitigate the risks associated with changes on aerodrome and its surroundings identified with the monitoring procedures.
- m) Define the scope, limits, tasks and responsibilities for the monitoring in coordination with the relevant local authorities and air traffic services providers, and other relevant authorities.
- n) Assess and mitigate the risks caused by human activities and land use which shall include but not limited to the following:
 - Obstacles and the possibility of induced turbulence;
 - Use of hazardous, confusing, and misleading lights;
 - Dazzling caused by large and highly reflective surfaces;
 - Sources of non-visible radiation, or the presence of moving, or fixed objects which may interfere with, or adversely affect, the performance of aeronautical communications, navigation and surveillance systems; and
 - Non-aeronautical ground light near an aerodrome which may endanger the safety of aircraft and which should be extinguished, screened, or otherwise modified so as to eliminate the source of danger.
- o) Protect area around the aerodrome visual aid outside aerodrome boundary all means of land acquisition (leasing, purchasing etc) or preventing new developments or extensions to existing structures from infringing the OLS.
- p) Report to CAA any infringement or potential infringement of the OLS of nature and location of obstacles, and any subsequent addition, or removal of obstacles for action as necessary, including amendment of the AIS publications.
- q) Take necessary measures to assess the risks resulting from an infringement of OLS to identify whether or not the object creates an unacceptable risk or not, and carry out the necessary actions to remove the obstacle or mitigate the risk as appropriate to protect aircraft using the aerodrome.
- r) Publish and mark, when needed and where necessary, and make visible by means of lights any remaining obstacles.
- s) Provide electronic obstacle data for all obstacles in Area 2 (the part within the aerodrome boundary) that are assessed as being hazardous to air navigation.

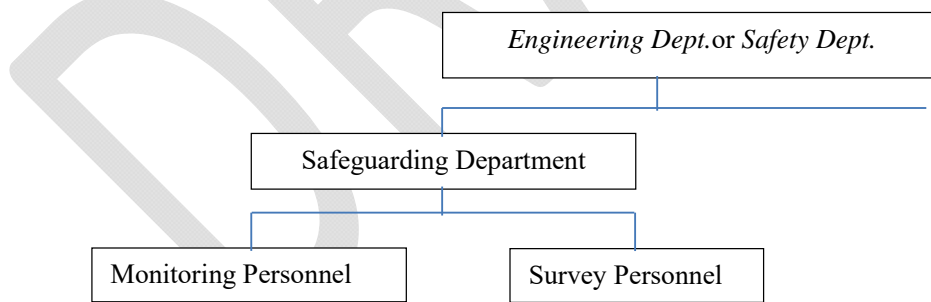
Examples of Typical Organizational Structure of Aerodrome Safety Management System



CAA Safeguarding Structure (Basic)



CAA Safeguarding Structure (Advanced)



Operator's Safeguarding Structure

Chapter 4

OVERSIGHT MATERIAL

4.1 Application

It is recommended the below questions are incorporated in existing safety oversight processes of national regulators in order to oversight the implementation and effectiveness of the model primary and supporting regulations.

The materials in section 4.2 may also be used by the aerodrome safeguarding prim stakeholder who holds primary responsibility for aerodrome safeguarding as part of their internal assurance audit processes.

The below checklists elements are recommended for aerodrome safeguarding activities.

4.2 Model Oversight Checklists

Model Checklist: Elements for Safeguarding Management System (within each of CAA and Aerodrome Operator)

Model Checklist: Elements for Aerodrome Safeguarding Division Terms of Reference

Model Checklist: Elements for Aerodrome Safeguarding Division Composition

Model Checklist: Elements for Composition of CAA Committee for Aerodrome Safeguarding

Model Checklist: Scope of Works of Aerodrome Safeguarding entity at the Aerodrome

Model Checklist: Scope of Works of Aerodrome Safeguarding entity at CAA

All were published with the first Advisory

APPENDIX A

Safeguarding Checklists

INTRODUCTION

- **The checklists were developed to give guidance for the purpose of:**
 - Starting Safeguarding System, or
 - As guidance for implementation and Obstacle Monitoring.
- **These checklists are result of Egypt's best Practice in Safeguarding with support of UAE, and England experience.**
- **It's up to each State to adjust the checklists to suit their national regulation and their view of implementation as long as keeping main line.**
- **List of references:**
 1. Annex 14 V.I
 2. Annex 15 (e.TOD)
 3. Annex 4 (Aeronautical Charts)
 4. Doc. 9137 Part 6
 5. Doc. 9774
 6. WGS-84 Manual9674
 7. Doc. 9981 ICAO PANS Aerodromes.

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