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| IALA Guideline |

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bird deterrents and bird fouling solutions

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# SCOPE

The scope of this document is to provide information on the problem of bird fouling on Aids to Navigation (AtoN) by focusing on identification of the detrimental effects of bird fouling and the possible use of effective bird deterrents or alternative solutions that allow clean AtoN easily.

This document will also provide details on case studies, trials and measures that authorities and organizations are using or have trailed, and the measure of success or level of effectiveness for those particular applications.

# AIM

The aim of this guideline is to provide:

* a definition of bird fouling and bird deterrents;
* details of the detrimental effects of bird fouling on AtoN structures, power supplies and lighting systems and its overall impact on AtoN reliability;
* details of Occupational Health & Safety (OH&S) concerns related to working in areas of excessive bird fouling;
* details of possible methods of bird deterrence and other remedial measures used to prevent bird fouling;
* information on accessing documents detailing previous experience in applications of bird deterrent systems and alternative solutions that allow clean AtoN easily, as experienced by IALA member countries and organizations.

# INTRODUCTION

All Aids to Navigation systems are affected it by a range of factors attributed to the impact of the environment, generating a frequently failure influencing their Level of Service (LOS) and important amount of preventive maintenance tasks on AtoN structures.

One of the environment factors with higher impact on the preventive maintenance tasks is the presence of bird colonies, due to they nest and migrate along the coast, sit on AtoN structures in search of an appropriate place to rest, thus progressively covering the surface, their elements and devices, generating a bird excrement layer (Bird fouling) that turns out to be abrasive, with a loss of conspicuity as a result.

Bird fouling is one of this consequences, and can be defined as the pollution or contamination of an area by bird droppings. In the context of this guideline it refers to the pollution or contamination of AtoN sites or associated structures.

Bird fouling of an AtoN site has detrimental effects on its availability and reliability, on workplace health and safety and, in general, results in accelerated structural deterioration.

A bird deterrent can be defined as a device or object that deters a bird from landing on, or using an AtoN or AtoN structure for any purpose. The deterrence of a bird from an AtoN will effectively remove the issues associated with bird droppings.

Bird deterrents can be used in a number of different scenarios such as helipads, lanterns / AtoN and associated structures, day marks, solar panels, buoys, facilities, other marine structures, fittings and components.

When the bird fouling of an AtoN cannot be avoided, alternatives must be developed to facilitate and reduce the times in the tasks of cleaning it.



Figure 1 Birds using the buoy like a point of meeting

# NEGATIVE EFFECTS OF BIRD FOULING

## FROM AN AVAILABILITY AND STRUCTURAL PERSPECTIVE

Bird fouling comes primarily from sea‐birds landing and roosting, or attempting to land and roost, on an AtoN site. The discharge of faecal matter is what causes the bird fouling, but it can also be related to shedding of feathers, nesting debris and presence of rotting food. Bird fouling can have, among others, the following detrimental effects on AtoN sites:

* Excessive bird lime coverage on lanterns or optics, causing obstruction of the light source, resulting in reduced nautical range or in severe cases, total outage of the AtoN;
* Excessive bird lime coverage of solar panels, reducing the active area of the panel and severely limiting battery charging capacity, which can lead to negative effects on night time signalling functions of the lantern and may eventually lead to total battery discharge and subsequent outages of the AtoN;
* Bird lime coverage on lighthouses or other daymarks can cause a change in the colour, severely affecting the ability of that AtoN to provide clear information to the user;
* Bird lime is highly caustic and can increase corrosion rates on AtoN structures, fittings and components, resulting in accelerated deterioration and reduced life span, higher maintenance costs and unsafe structures;
* Bird fouling on any site generally pollutes and contaminates, causing a number of associated issues.

## FROM AN OCCUPATION HEALTH & SAFETY PERSPECTIVE

Excessive bird fouling causes serious OH&S risks for personnel involved in routine maintenance or inspection. Whilst the OH&S risks are most commonly associated with the odour caused by birdlime build up, other risks are quite varied. A summary of some of the OH&S risks are provided below:

* Exposure to the excessive odour of birdlime build up can cause respiratory and other illnesses. Dried birdlime can become an air pollutant during cleaning or when disturbed.
* Numerous diseases are carried or caused by birds, from both their bodies and their droppings and serious risks arise from disease organisms growing in the nutrient rich accumulation of bird droppings, feathers and debris. Some of these diseases can be passed onto humans.
* Insects or parasites (ticks, mites, fleas, lice etc.) that live on birds or their droppings may become a problem with particularly severe infestations. These can be passed onto humans with contact and can cause both minor and serious health issues.
* Birdlime can cause slippery conditions on AtoN, especially when wet. This therefore increases risks associated with slipping, falling and generally magnifies all other risks normally associated with working at heights.

# METHODS FOR DEALING WITH BIRD FOULING PROBLEMS

There are different methods / solutions to mitigate bird fouling on AtoN structures, such as implementing commercial products and deterrent systems, the application of engineering solutions, structural changes or revised installation methods, and if it is impossible to deter bird colonies, It should try to minimize the negative effect of birds fouling in the aids to navigation systems and in the maintenance tasks associated with cleaning.

The exact method should be tailored to suit a particular site, situation and in some cases, may need to be designed to suit the visitation habits of a particular species of bird.

Some examples of methods / solutions can be classify in following way:

* Alternative solutions
* A bird repellent gel to keep away the birds that affect the Aids to navigation.
* A self-adhesive vinyl product that should be replace on each cleaning operation
* Implement as a viable solution different paint scheme, for example: double treatment.
* Implement to protect the Aids to navigation surfaces a colorless layer that protects the final coating and facilitates the removal of excrement and spray paint.
* Physical solutions
* Bird spikes
* Bird rollers
* Visual bird deterrents as ‘scarecrows.’
* Variation of installation of components and fittings
* Electronic solutions
* Install an electronic audible bird deterrent
* Install an electrical bird deterrents system.

It should be noted that each country has its own regulations and laws regarding bird protection; in this sense, the solution must be environmentally sustainable.

## Alternative solutions

### BIRD REPELLENT GEL

There is a wide range of market-products ready that cause insects, birds or animals to stay away, become unstable or stick to the surface.

The bird repellent gel is an alternative solution, due to easily applied on a clean dry surface with a palette knife, paint brush or roller. Non-toxic, it can be handled without protection and is harmless to birds. It is designed to affect birds’ senses and produces instability due to the fact that the heat felt in the birds’ claws prevents them from clinging firmly onto the surface, so they fly away.

But there are certain practical and functional restrictions to applying this gel solution on buoy surfaces, as:

* Buoy hull surfaces get wet and this gel product is water-soluble.
* Product degrades when buoy is exposed to high temperatures during the summer.
* Dirt adheres to the gel, hence it will build up on the gel-covered hull.

Consequently, this alternative is bound to be short-lived and hard to evaluate.

It is also worth noting this solution does not fare well with large colonies, since their massiveness prevents the gel from ‘training’ the birds.

### VINYL SELF-ADHESIVE PROTECTION

Depending of criticality of element that want it to protect, an application of vinyl film can be a solution if you want to protect a solar panel or a lantern, but if decide it to apply on the surface of a buoy hull, these are some drawbacks could be appear:

* Operative difficulty to put the vinyl coating in situ since it had to be applied with a heat gun.
* Film had to be water-tightly sealed onto the surface in order to prevent water and dirt from seeping in.
* The two (2) full hours required for the application of the vinyl coating could be incompatible with an onboard worker’s daily maintenance tasks.
* The mechanic protection can be quite feeble, thus being damaged by the contact with the operator’s shoes during routine maintenance and does not resist pressure washing, so the entire vinyl coating should be changed when is damaged.

Images shows crew using a heat gun to thoroughly transfer a protective vinyl film onto the test buoy.



Figure 2 Installation of vinylic self-adhesive protection on the hull

Although bird guano is virtually inevitable for all aids to navigation, cleaning and maintenance procedures can be certainly improved.

### MODIFICATION OF THE PAINT SCHEME

When the Aids to navigation are built in steel, one solution to protect the surface can be modify the final stage of the painting process in order to reduce adherence and obtain a vitrified surface, easy to wash and onto which excrement would not stick.

The cleaning task is done faster, the guano is easily removed and less water is needed, which is not a minor detail since the pressure washers use clean water, that is, potable water intended for consumption on board, to protect the filters and peaks.

Images show the same doubly cured buoy covered in bird guano and after being pressure-washed respectively.



Figure 3 Buoy with double curing paint treatment covered with bird excretions and after pressure wash

These solutions imply some practical considerations:

* Modification of the painting process and drying cycle of steel aids to navigation must be more demanding due to the precision required with regard to the control of the parameters of temperature, humidity, dew point and treatment times.
* Accelerated degradation of color produced by the high temperatures and the UV rays upon the glasslike surface of the buoys.
* Increase risk related to crew safety for having to work on a slippery surface.

### COLORLESS PAINTING – ANTI-GRAFFITI

The aplication of a colorless paint that acts as an anti-graffiti coating can be the best solution to implement on buoys, due to it can be applied on clean surfaces with a paint brush, roller, blowtorch or sprayer and is touch-dry after 15 to 30 minutes, depending on the ambient temperature and humidity and requiring approximately ¼ liters per buoy.

During the cleaning stage, it must be ensured that the washing pressure used is the necessary one, since if the guano cannot be detached it will be necessary to use mechanical means (brush and detergent) to clean it, being a determining factor the distance and the position of work of the lance of the pressure washer

Images shows one buoy coated with the anti-graffiti paint, before pressure washing and result of the cleaning process.

 

Colorless paint implementation represent advantages respect others:

* A successful implementation depends on the systematic preventive application of the product on clean dry surfaces.
* Reduced work time: as it is impossible to utilize any preventive methods against birds laying guano on the aids to navigation units, a cleaning solution can be adopted, managing to reduce cleaning times
* Specific vs. massive implementation on aids to navigation system: there exists a wide array of viable solutions depending on the type of AtoN system affected and the degree of impact posed by guano upon them. An electronic bird deterrent should be an effective solution for a lighthouse whereas a cluster of buoys would required another an alternative solution
* Sustainability and Impact on local fauna: Any soltution implemented should be biodegradable harmless and approved by the environmental protection authorities.
* Operational and Cost effectiveness: The concept of ease of use should be prioritize to optimize onboard worker’s daily maintenance tasks.
* The anti-graffiti colorless paint although it does not provide seamless protection, it enables easy and effective removal of bird guano from buoy hulls.
* As disadvantage, since the colorless coating is water soluble, it is rendered less effective under weather conditions with rainfalls.

Images shows how port buoy look before and after being pressure-washing.



## Physical solutions

### BIRD SPIKES

Bird spikes can be a cheap and effective way of deterring birds from landing on some structures. There are several commercial types of bird spikes available that can be installed on most parts of an AtoN structure, fittings or components.

The effectiveness of bird spikes depends on several factors.

The method of installation is critical and bird spikes must be installed to withstand the effects of wind, waves, bird collision and other environmental factors they may be exposed to in‐situ. The level of adhesiveness must be considered to ensure that they remain in situ and do not break off, or are knocked off by birds contacting them.

Bird spikes must also be designed and fabricated from durable materials, to withstand harsh environmental conditions.

The schedule of inspection and maintenance will also affect bird spikes as they are not necessarily items designed with a long life span in mind.

Many lantern brands now have permanent or semi‐permanent ‘in‐built’ bird spikes, or components and fittings that allow installation of bird spikes. This can be considered when choosing equipment for a site where exposure to bird fouling may be an issue.



### VISUAL BIRD DETERRENTS

There is a wide range of options and methods of using visual bird deterrents, and usually involves installation of a device or piece of equipment that is used to scare or deter a bird from landing, rather than physically preventing a landing. These types of devices are sometimes referred to as ‘scarecrows.’ Many interesting variations on this theme have been trialled around the world by AtoN authorities and service providers.

Results of past applications show that certain species of birds may, after some time, tend to habituate and become used to foreign items, thereby negating the usefulness of visual bird deterrents in some circumstances.

### BIRD ROLLERS

Bird rollers are commercially available and have proven to be successful when used in the correct application.

Bird rollers are usually installed on hand rails or other areas that may provide purchase or a landing for visiting birds. The rollers provide a moving and constantly rotating surface on which birds cannot land. Again it is important to consider all aspects of the installation, like the schedule of inspections and visiting, the remoteness of the location and the expected bird pressure.



### VARIATION OF INSTALLATION OF COMPONENTS AND FITTINGS

In the case of solar panels, it is possible to change the method of mounting, i.e. mount them vertically to prevent bird lime smear; however, this requires careful consideration of the effects on power supply and reliability for the

AtoN and will usually require additional solar panels to address power loss. In some cases, the limited room available on a structure may prevent that option being feasible.

Installing cones on the top of flat lantern surfaces has also proved successful in some applications, as it effectively removes areas for bird purchase.

Depending on the species of bird causing the fouling, another consideration is changing the angle or elevations of possible landings. Practical observations on some types of sea birds, particularly seagulls indicate that they defecate in nearly horizontal bursts, whilst perched on steel buoy guard rails. So installation of a simple elevating platform may prove effective in redirecting the spray of bird faecal matter, thus removing issues with smearing on nearby lanterns or solar panels. This option needs careful consideration of the species of birds causing issues for a particular site and also the location of the set out of the different AtoN components.



## Electronic solutions

### AUDIBLE BIRD DETERRENTS

Audible bird deterrents or bird scarers have been used in many locations, with varying levels of success. Experience shows it is particularly important to consider the species of bird being targeted when considering audible bird deterrents as a viable option.

Audible bird deterrents can include devices that emits bird calls or other noises that cause birds distress. These devices come in a variety of shapes and sizes and can emit noises at regular intervals or even fitted with remote sensors that ensure noises are only emitted when movement is sensed. The power supply requirements and electronic components may make these items unsuitable for remote area installations whereas they may prove to be the preferred choice in areas where power supply is regular and maintenance and inspections can be carried out regularly.

As shown on Image, the audible bird deterrent can be a small-scale standard kit ready to be installed inside an enclosed space, but exposure to the vandalism.

The power consumption, size and weight are compatible with devices viable to be installed on floating Aids to Navigation, likewise could be necessary to resize the energy system in case to ad another electronic device at the AtoN.

Suppliers of commercial bird deterrent systems can be sourced quite easily through internet searches and often provide services to identify the right type of product needed for a specific bird related problem.



Port buoy with audible device



Audible Bird Deterrent installed on pontoon

### ELECTRICAL DETERRENTS

Various versions of electrical systems have also been trialled with good success. Electrical fence systems have the possibility of eliminating birdlime issues, providing the correct engineering and design considerations are taken into account. This process has proved especially successful when built into a structure’s design during the initial design phase, as it allows the designer to make considerations in minimizing bird purchases and also ensuring that installation of the electrical system is facilitated both in terms of space and power supply. Most components of these systems are commercially available and utilize the same equipment as standard electrical cattle fences. Full

systems, specifically designed for use for bird control are also commercially available on the pest control market.





# GENERAL COMMENTS

Rainfall can reduce the adherence of guano to the surface of the Aids to navigation: the longer the surface remains wet, the lower the chances of adherence;

* For electronic / electrical devices:
* For remote installations (buoys or beacons) must be considered the audible bird deterrent will set at low output in order to limit power consumption, therefore effective coverage radius will be poor - around 15 meters-.
* For lighthouses can be a reasonable solution installations of this kind of equipment, because power consumption, range action and installation are usually solved.
* For cleaning task:
* The position and distance of the water gun and a pressure of at least 120 bar, are critical to the performance of pressure washers during cleaning operations.
* Non-destructive mechanical means, such as bristle brush to finish up the washing process may also be necessary.

In table 1 it has been realized a ranking of the alternatives taking in consideration sustainability, durability, cost, etc.



Table 1 – Ranking of alternatives

# EVALUATION OF ALTERNATIVES

From a technical point of view, the decision to implement one or another solution is associated with the operations of maintenance of the signaling system analyzed, depending on:

* Level of Service
* Weather conditions
* Type of Aids to navigation
* Type of buoy tender
* Human Resources, suitability of the crew
* Impact of bird guano on Aids to Navigations and their elements
* Technical and economically solution should be feasible in case its implementation is massive.

# ENVIRONMENTAL CONSIDERATIONS

Whilst the principal reason of a bird deterrent is to keep birds from landing or roosting on an AtoN component or structure, a fine line must be drawn to ensure that the method is not overly harmful to birds, for the simple reason that not all birds visiting the structure are necessarily pest species. It is possible that birds of high ecological value or a protected status will also attempt to use the structures.

A countries environmental or fauna legislation will usually stipulate the regulations to which an authority or service provider needs to act in relation to this subject. There may also be legislation or guidelines that identify bird species of concern.

Competent authorities and responsible service providers should also ensure that this issue is addressed in their environmental management system, so an attempt is made to identify interaction (and its impacts) with any endangered bird species or wildlife in general.

# OTHER REFERENCES

Additional case studies and reports on bird deterrents and their effectiveness can be found on the IALA Wiki. The IALA Wiki is only available to IALA members and can be accessed from the IALA Website (<http://www.ialaaism.org>).

Development and implementation of technical, economical and environmental friendly solutions to cope birds’ guano on aids to navigation – Best Practice Competition IALA Conference Korea 2018.

# ACRONMYMS

AtoN Marine Aid(s) to Navigation

IALA International Association of Marine Aids to Navigation and Lighthouse Authorities

OH&S Occupational Health& Safety