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Title: **TRANSMISSION BIRD COLLISION PREVENTION GUIDELINE**

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Content

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1. Introduction

A bird collision incident happens when a bird physically strikes either the overhead conductor or the overhead ground wire of a power line. In the case of transmission lines, the overhead ground wire is usually involved. It is generally accepted that birds can usually avoid the highly visible bundled conductors but often fail to see the thin ground wire. In South Africa, bird collisions with transmission lines are a major form of unnatural mortality among several threatened species. Research is ongoing to attempt to gauge the effect of this form of mortality on these species, especially cranes. Preliminary results indicate that the mortality could be unsustainable for regional populations of species such as Blue Cranes in the central Karoo.

2. Background and extent of the problem of bird collisions

Collisions are the biggest single threat posed by transmission lines to birds in southern Africa (van Rooyen 2004). Most heavily impacted upon are bustards, storks, cranes and various species of water birds. These species are mostly heavy-bodied birds with limited manoeuvrability, which makes it difficult for them to take the necessary evasive action to avoid colliding with power lines (van Rooyen 2004, Anderson 2001).

Unfortunately, many of the collision sensitive species are considered threatened in southern Africa. The graph below shows the number of collisions reported per species on transmission lines from August 1996 to present (EWT unpublished data). Most of the heavily affected species are Red Data species. It should be noted that these are only the reported mortalities, it is suspected that a large number of mortalities go unreported. It is also important to note that the mortalities recorded by Anderson (2001) as discussed below are not included in the graph below.

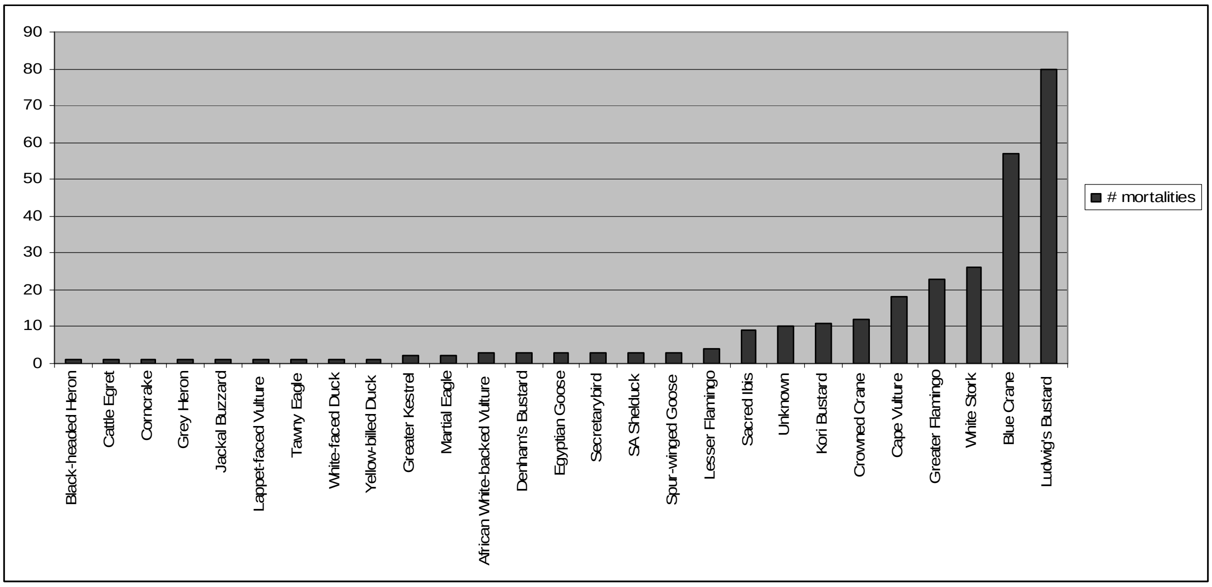


Figure 1111: Number of reported collisions per species on transmission lines from August 1996 to the present (EWT unpublished data).

Although significant in itself, figure 2 is not a true reflection of the extent of the problem, because few of the collision localities were closely monitored over a substantial period of time. Where long term monitoring did happen, the picture is disturbing. In one instance, where bi-monthly monitoring did take place, a single 10 km section of 132kV distribution line killed 59 Blue Cranes, 29 Ludwig's Bustard, and 13 White Storks in a three year period (van Rooyen unpubl. data). In 2004, fifty-four Blue Crane carcasses were discovered near Graaf-Reinett in the Northern Cape province under 3.7km of distribution line.

Data collected in the Northern Cape province between 1997 and 1999 provides further evidence of the gravity of the problem. During an initial clearing of transects, a total of 194 large bird carcasses were found under 40km of Transmission line (220 and 400kV) near De Aar in the Northern Cape. Subsequent monitoring of 140 km of power lines (transects of 10km each from 22kV up to 400kV) in the same area over a period of 12 months produced another 196 carcasses (mostly cranes and bustards) the majority under transmission lines (Anderson 2001).

The Red Data species vulnerable to power line collisions are generally long-lived, slow reproducing species under natural conditions. Some require very specific conditions for breeding, resulting in very few successful breeding attempts, or breeding might be restricted to very small areas. A good example of this is the two flamingo species that occur in southern Africa, which have experienced hardly any successful breeding attempts at Etosha Pan in Namibia for several decades. Another example is the Great White Pelican that only breeds successfully at Dassen Island in the Western Cape. These species have not evolved to cope with high adult mortality, with the results that consistent high adult mortality over an extensive period could have a serious effect on a population's ability to sustain itself in the long or even medium term. Many of the anthropogenic threats to these species are non-discriminatory as far as age is concerned (e.g. habitat destruction, disturbance and power lines) and therefore contribute to adult mortality, and it is not known what the cumulative effect of these impacts could be over the long term.

Using Vortex computer modelling, the South African Crane Working Group estimated that an annual mortality rate of 150 adult Blue Cranes could reduce the eastern population of Blue Cranes (app. 2000 individuals in Mpumalanga and KwaZulu-Natal) by 90% by the end of the 21st century (McCann *et.al.* 2001). At that stage the population would be functionally extinct.

From the figures quoted above, it is clear that power lines are a major cause of avian mortality among power line sensitive species, especially Red Data species. Furthermore, the cumulative effects of power lines and other sources of unnatural mortality might only manifest itself decades later, when it might be too late to reverse the trend. It is therefore imperative to reduce any form of unnatural mortality in these species, regardless of how insignificant it might seem at the present moment in time.

3. Solutions to the problem of bird collisions.

3.1. Background

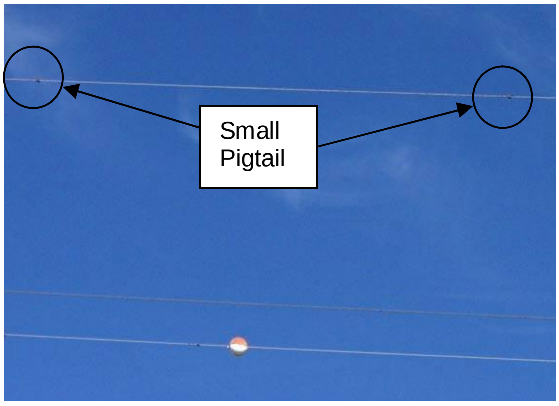
A measure that has been proved to be reasonably successful in reducing collisions is to fit the earth wire with anti-collision devices.

Figure 2222: The installation of flappers on the shield wire from a helicopter.

Success rates of up to 60% reduction in mortality and even more have been documented (Ferrer and Janns, 1999). There are several devices available in southern Africa for the marking of power lines. These devices will be described below and the advantages and disadvantages discussed. The fitting of the marking devices are typically done from a helicopter, which adds considerably to the cost of any project.

3.2. Static devices

Static devices are mechanically more durable than dynamic devices because they lack the element of wear and tear that moving parts inevitably have. However, in South Africa, static devices, particularly the so called Bird Flight Diverter (also known as the pigtail) has had limited success (Anderson 2001). The most obvious reason seems to be that they are simply less visible, especially the small ones (see figure 5). A better option would be to use the bigger pigtail (see figure 5, right), although it is still not the preferred option.



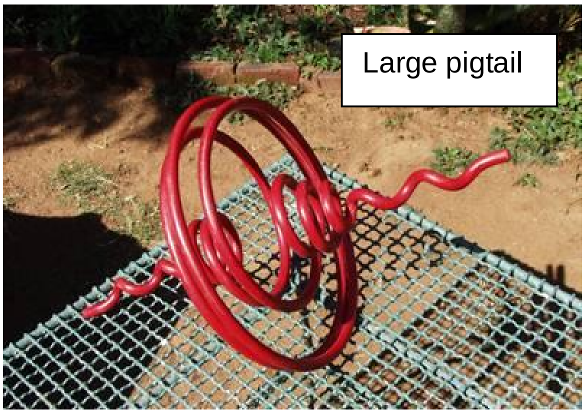


Figure 3333: Example of static devices.

3.3. Dynamic devices

Dynamic devices (usually called bird flappers), have moving parts as opposed to static devices where there are none.. Dynamic devices are very effective in reducing collisions as the birds seem to see them very well (van Rooyen unp. data) probably because of the movement that attracts attention. The disadvantage of dynamic devices is that they are subject to extensive wear and tear, inevitably limiting the lifespan of the device. Wear could result on the device itself as well as on the cable to which it is attached.

Figure 4444: Examples of the dynamic bird flapper devices

This has obvious cost implications if a line needs to be re-marked at intervals of a few years. No solution to that problem has been found to date and it must be accepted as a constraint. Figure 4444Figure 44 shows examples of bird flappers currently available on the market.

3.4. Reflective devices

A new product that shows great potential is the Inotec BFD88, a reflective stainless steel sphere of 70mm diameter. Experiments have shown the visibility of this device to be superior to coloured (red, yellow, white, black) objects especially during the low light conditions at dawn and dusk when birds may be flying from roosting areas to feeding areas and back. Due to the spherical shape, the device reflects any available light in all directions and is therefore visible from all directions including above or below the diverter. The diverter does not require direct sunlight and is effective during overcast conditions and the low light conditions before sunrise and after sunset (Van Rooyen, pers obs.) When viewed during these low light conditions the device is particularly visible against dark backgrounds such as the ground, trees or high ground. It is also particularly visible against bright cloud when viewed from below.

Figure 5555: A Reflective Bird Diverter (left) installed on a line with conventional bird flappers (right).

Figure 6666: An example of reflective diverters on a test line at dusk with white conventional bird flappers in between

An option could be to string the Inotec NFD88 diverters close enough to form a dotted line on each earth wire on those spans crossing the river (see figure 6). **Due to the relatively small size of the spheres, it would need to be spaced very close together to make it effective, maximum 5 metres apart on both earth wires.**

3.5. Spacing intervals

Research in the Netherlands has shown that spacing intervals have a major influence on the effectiveness of anti-collision devices. In South Africa, the same has been found. See Figure 7777Figure 77 for a suggested marking method with Bird Flappers. In the case of the Inotec BFD88 diverters, a similar 5 metre interval is suggested.

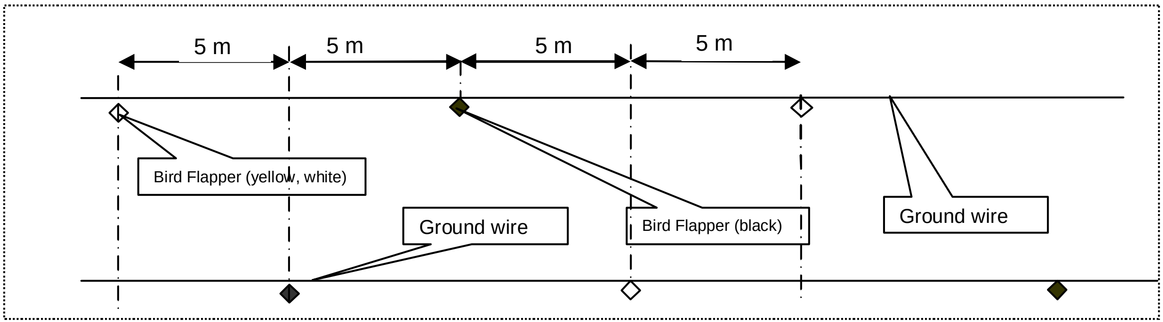


Figure 7777: Marking method with Bird Flappers on overhead ground wires (viewed from above)

NB. It is important to alternate the colours (yellow-white) in order for maximum contrast.

3.6. Portion of span to be marked.

Only the middle 60% of each span needs to be marked as this is where most of the collisions occur.

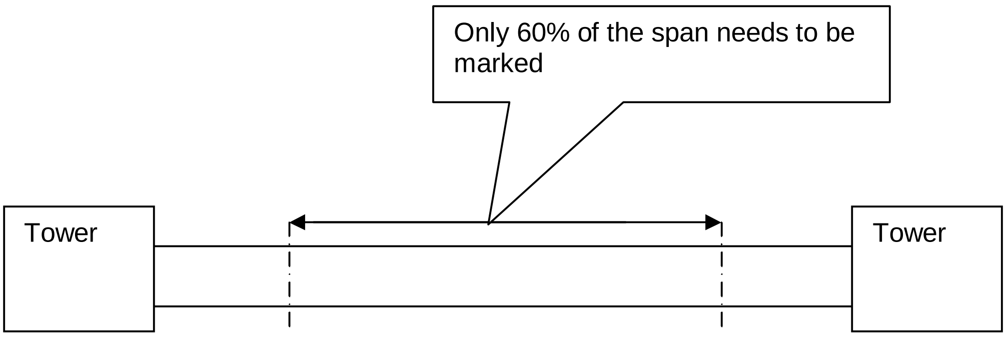


Figure 8888: The section that needs to be marked

3.7. Illuminated devices.

A specific problem is posed by birds that fly at night, for example flamingos that migrate great distances at night. A device is available for this problem, namely the Mace Bird Lite, which is a Perspex tube with a fluorescent tube inside.

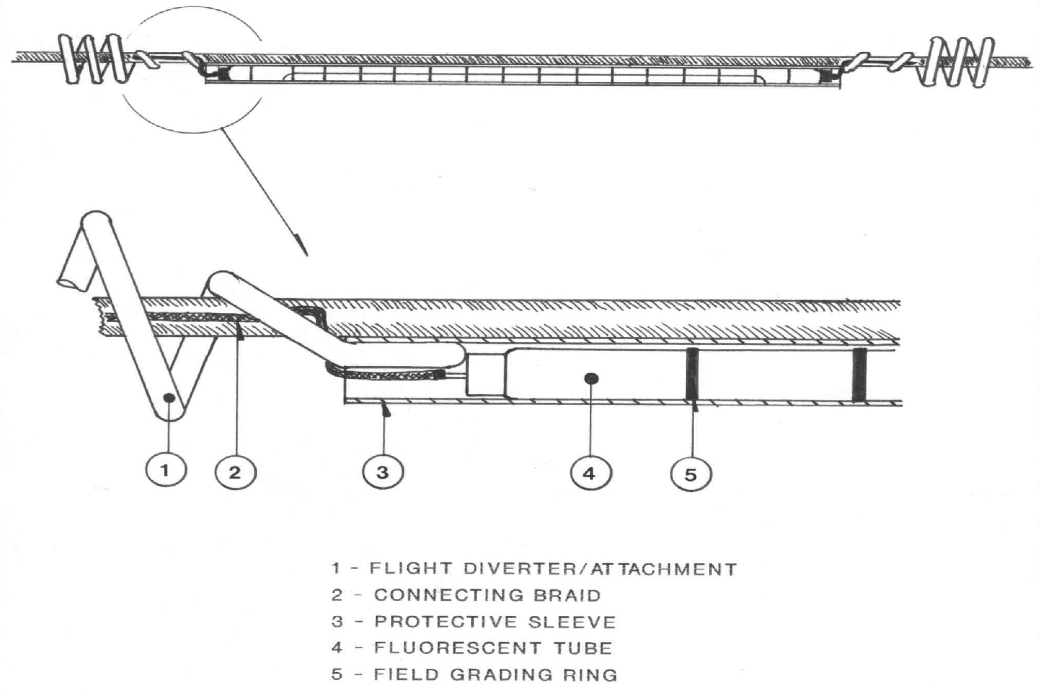


Figure 9999: The Mace Bird Lite

It is mounted on the overhead ground wire and the light is energized by the ambient electrical field generated by the conductors. It has been used in South Africa and Botswana and is reported to have worked well for curbing flamingo mortality on power lines. No scientific data is available on the effectiveness but it is generally claimed to be effective.

3 Supporting Clauses

Index of Supporting Clauses

3.1 Scope

This document covers the subject of bird colliding with Transmission lines.

3.1.1 Purpose

The purpose of this document is to describe the problem of bird collisions with transmission lines and to indicate which mitigation methods are available to address the problem.

.1.2 Applicability

This guideline shall apply throughout Transmission Division.

3.2 Normative/Informative References

Parties using this guideline shall apply the most recent edition of the documents listed below

3.2.1 Normative

Anderson, M.D. 2001. The effectiveness of two different marking devices to reduce large terrestrial bird collisions with overhead electricity cables in the eastern Karoo, South Africa. Draft report to Eskom Resources and Strategy Division. Johannesburg. South Africa.

Alonso J A and Alonso J C, Mitigation of bird collisions with transmission lines through groundwire marking. In: Ferrer M and Janss F E (eds), Birds and powerlines, Quercus, Madrid, 1999, pp113 – 124.

Alonso J A and Alonso J C, Collision of birds with overhead transmission lines in Spain. In: Ferrer M and Janss F E (eds), Birds and powerlines, Quercus, Madrid, 1999, pp57 - 82.

Van Rooyen, C.S. 2004. The Management of Wildlife Interactions with overhead lines. In The fundamentals and practice of Overhead Line Maintenance (132kV and above), pp217-245. Eskom Technology, Services International, Johannesburg.

3.2.2 Informative

Barnes, K.N. (ed.) 1998. The Important Bird Areas of southern Africa. BirdLife South Africa: Johannesburg.

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Harrison, J.A., Allan, D.G., Underhill, L.G., Herremans, M., Tree, A.J., Parker, V and Brown, C.J. (eds). 1997. The atlas of southern African birds. Vol. 1&2. BirdLife South Africa: Johannesburg.

McCann, K., Morrison, K., Byers, A., Miller, P. & Friedman, Y. (eds). 2001. Population and Habitat Viability Analysis for the Blue Crane (Anthropoides paradiseus). Conservation Breeding Specialist Group (SA), Endangered Wildlife Trust, Johannesburg.

Van Rooyen, C.S. and Ledger, J.A. 1999. “Birds and utility structures: Developments in southern Africa” in Ferrer, M. & G..F.M. Janns. (eds.) Birds and Power lines. Quercus: Madrid, Spain, pp 205-230

Van Rooyen, C.S. 1999. An overview of the Eskom - EWT Strategic Partnership in South Africa. (EPRI Workshop on Avian Interactions with Utility Structures 2-3 December 1999, Charleston, South Carolina.)

Van Rooyen, C.S. 2003. Mitigation programme for Avian Collisions with Eskom Transmission Lines. Unpublished Progress Report, September 2003. Endangered Wildlife Trust, Johannesburg, South Africa.

Avian Powerline Interaction Committee (APLIC), Mitigating Bird Collisions with Power Lines: The State of the Art in 1994. Edison Electric Institute, Washington D.C. 1994, pp77.

Williams A J and Velasquez C, Greater Flamingo *Phoenicopterus rubber*. In: The atlas of southern African birds, Volume 1: Non-passerines, Harrison, J.A., Allan, D.G., Underhill, L.G., Herremans, M., Tree, A.J., Parker, V & Brown, C.J. (eds). BirdLife South Africa, Johannesburg, 1997, pp112 - 113.

C van Rooyen, Nelson P and Kambouris D, Strategic partnerships as a mechanism to address wildlife interactions with powerlines: The South African approach. Session 15, Proceedings of the Cigré Fourth Southern Africa Regional Conference, Somerset-West, Cape Town, 2001, pp1-7.

Koops F B J and De Jong J, Vermindering van draadslachtoffers door markering van hoogspanningsleidingen in de omgeving van Heerenveen. 1982 Electrotechniek 60 (12): pp641 – 645.

3.3 Definitions

N/A

3.4 Abbreviations

EWT: Endangered Wildlife Trust

3.5 Roles and Responsibilities

The Line and Servitude managers of each Grid shall be responsible to ensure compliance with this document.

3.6 Implementation Date

The implementation date is November 2006.

3.7 Process for monitoring

The line and Servitude managers of each grids shall monitor servitudes for evidence of bird collisions and inform the EWT accordingly.

3.8 Related/Supporting Documents

n/a

4 Authorisation

This document has been seen and accepted by:

Name	Designation
W Majola	GM (Services)
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5 Revisions

Date	Rev.	Remarks
November 2006	0	Review document. Add latest equipment available - remain Rev. 0 because of the new reference number.

6 Development team

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