# Der Kormoran *(Phalacrocorax carbo)*

## im Spannungsfeld zwischen Naturschutz und Teichbewirtschaftung

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**Introduction**

It was in 1987 that optical bird scaring using a portable laser gun was discovered by chance in the Pyrenees mountains at Sainte Marie de Campan. The French civil aviation had previously performed some trials with big lasers but they were not conclusive enough since the system was obviously too heavy.

The first birds scared by a FL R 005 laser gun were a crow and a magpie. These birds were perched on trees at about 150 m from the marksman. Other trials were carried out immediately afterwards on other crows up to distances of about 600 m. The very good initial results were analysed and followed up. More powerful laser guns and laser guns with different beam colour were built. All these trials led to the standardization of a FL R 005 model laser gun which is most suited to bird scaring. Since then, the Office National de la Chasse based in Vendée at the Ile d'Olonne and the Servizio Caccia e Pesca di Modena have undertaken evaluation programmes of this product.

These guns are used among other things for the battle against dormitories of cormorants and other birds.

**First Part: A means of scaring birds: the laser gun – description and applications to cormorants and other birds**

**1. Equipment**

The optical scaring products proposed up to now are of three types:

- the laser gun model FL R 005
- the hand laser tool OLM R 005
- the laser projector PRLM R/V 001

***The laser gun model FL R 005***
This product is suitable for scaring birds, alone or in a dormitory, which can be at quite large distances. Trials have been validated by the French national hunting agency up to 2.5 km (TROLLIET).
Because of the presence of the aiming sight, this product can also profitably be used in towns since we can define well the zones in which we want to send the laser beam, and only these, with great precision. This is the most suitable equipment for scaring cormorants.

***The hand laser tool OLM R 005***
This device was built based on elements of the laser gun FL R 005; its essential elements are employed but not the aiming sight nor the butt.

***The laser projector PRLM R/V 001***
This unit is placed on factory roofs and is remotely piloted from a surveillance post to watch over the roofs and scare away birds in total darkness.

**1.1 Technical description of the laser gun model FL R 005**

By its shape, the laser gun model FL R 005 looks like an ordinary hunting gun. The barrel has been purely and simply removed and replaced by a HeNe laser tube of the appropriate power. The electrical power source of the tube is fitted inside the butt. A divergence reducer situated in the extension of the laser tube allows the beam to be sculpted so that it has well defined optical properties. An aiming sight is placed on the top of the laser gun. A watertight battery slung across the shoulder provides a low voltage power supply. There is a safety catch on the gun so that the trigger cannot be accidently activated producing an unwanted emission.

**1.2 Firearm legislation**

The law of 5 may 1995 modified all French regulations, with the effect that they are now in agreement with European legislation.
According to the Contrôle Général des Armées Francais, the laser gun model FL R 005 is not subject to firearm legislation.

### 1.3 Standards to be respected, safety

#### 1.3.1 The standards to be respected are the European standards

The European standard to be respected for the use of these devices is the standard EN 60825-1 (Safety of laser products. Part 1: Equipment classification, requirements and user's guide). We took as a working hypothesis the criteria of perception and visual safety applicable to humans.

#### 1.3.2 Laser risks incurred

The ocular risk incurred is defined by the nominal ocular risk distance denoted NORD. In our case, the NORD can be indicated by two cases:

**Case No.1: Direct vision in the beam during 10 seconds**

The calculation shows that the distance to respect between laser output and eye is 43.62 metres.

**Case No.2: Direct vision in the beam at the minimal distance as a function of the palpebral reflex of 0.25 seconds**

The calculation shows that minimum safety distance taking into account the palpebral reflex is 12,72 metres.

Conclusion and elementary precaution: do not point the gun towards the eyes of people who are close by:

#### 1.3.3 People who are competent to train users and entitled to do so by the manufacturer

The people entitled to train personnel and found apt in laser techniques by the manufacturer Desman S.A.R.L. are: for France: Mr. BERTRAND TROLLIET ONC, for Italy: Mr. MAURO FERRI, for the united Kingdom: Mrs. HELEN MCKAY and Mr. JOHN ALLAN. Other people who are liable to train personnel without the entitlement of the manufacturer must conform to paragraph 10.10 of the European standard.

## 2. Perception by birds

### 2.1 How the bird perceives the laser

The bird is scared by the visual discovery of the presence of the laser spot in his close surroundings.

- If the bird is looking in front, into the distance, in the direction of the marksman, it can see the whole beam due to the reflection of the emitted photons by dust particles and traces of humidity in the atmosphere.

- If the bird looking towards the ground or an obstacle, it will see a multiform red laser spot provoked by the meeting of the laser beam and the close surroundings: leaves, branches, grass, stones, tree trunks, water, etc.

### 2.2 Variable elements due to the marksman which influence the bird's visual perception

Notion of marksman shake and aiming errors

We recall beforehand that the laser beam can be emitted, according to the marksman's wishes, for variable durations from a few seconds to a few minutes. Note that all marksmen shake and it is practically impossible to hold an aimed arm completely motionless. Shaking and aiming error are amplified since, as the distance from the marksman increases, the apparent amplitude increases. These erratic movements are amplified by the marksman/target distance. But the beam is still visible during these erratic movements, and bird scaring continues all the same.

### 2.3 Variable elements due to the surroundings which influence the bird's visual perception

Notion of albedo of a reflecting surface

Albedo is the ability of surfaces to reflect a greater or lesser part of light radiation. We think that the difference in albedo between two surfaces may influence the effectiveness of laser scaring. Indeed, in identical light conditions, if we project

the beam onto a white surface the red laser spot will be more visible than on a black surface. This notion of albedo can only be studied in the case of indirect vision of the beam.

Notion of average scene lighting:
Experience shows that effectiveness also depends on the lighting of the dormitory. Indeed, an urban dormitory is better treated if it is not lit up. This observation has notably been made on starling dormitories.

The humidity of the ambiant air:
The ambiant humidity is a value which very clearly influences the results. This has been noticed, notably during trials carried out in the Venice Lagoon in the Valle Grassabo.

### 2.4 The two criteria of amelioration due to the birds

Two criteria probably contribute to the amelioration of the results. These criteria are: the stress or the state of vigilance of the animal and group effects.

The stress or the state of vigilance of the animal:
The stress or the state of vigilance of the animal is also a non-measurable value which seems to us to be capable of influencing the birds' reaction. Some tests carried out at Modena on starlings (FERRY) showed that optic scaring coupled with acoustic scaring gave very good results.

Group effects:
A strong group effect has been observed for the cormorant (TROLLIET) despite the absence of an alarm call in this species.
The triggering of the group effect has also been observed at Santander during laser scaring actions on urban starling dormitories as well as in other towns on crows. At the beginning of the scaring, the calls of a certain number of birds can be heard, these calls increase as we scare more and more birds. Finally a climax in noise level and agitation is attained that can be compared to a "putting under pressure" (stress + group effect) of the dormitory. When the climax is reached, a good effectiveness, in terms of bird departures, is observed.

## 3. Use and Effects

### 3.1 Using conditions

The use of the laser gun requires adequate luminosity conditions and any case always less than 1,200 lux. Thus, the period of effectiveness of the laser gun starts in the evening at nightfall, continues during the night until morning, when the luminosity passes the threshold of about 1,200 lux.

The notion of required luminosity of 1,200 lux may be variable. Indeed, if the equipment is used in cloudy, misty, rainy or snowy weather, the threshold of 1,200 lux can be greatly increased as a function of the combination of these elements.

### 3.2 Results obtained on cormorants under various conditions

Numerous tests have been carried out since February 1993 by the French national hunting agency in Vendée (TROLLIET 1993 and unpublished). These results should be the subject of a complementary publication in the near future. Apparently, the luminosity is not the only element to be taken into account in order to obtain good scaring. Indeed, the presence of snow, fog, cloud cover or thick clouds seems to be one of the elements which determine success. On the other hand, a clear sky after rain seems to have an unfavourable influence on the scaring. This could be due to a "washing" of the atmosphere which, afterwards, contains less particles to diffract the laser beam.

### 3.3. List of the most commonly treated birds

Crow *(Corvus frugilegus)* – Pink flamingo *(Phoenicopterus ruber)* – Seagulls *(Larus argentatus* and *Larus ridibundus)* – Pigeon *(Columbia livia)* – Starling

*(Sturnus vulgaris)* – Cormorant *(Phalacrocorax carbo)* – Other species.

**4. Possibilities of application**

It seems to us that laser scaring actions on Cormorant dormitories are today essential in order to disturb the tranquillity of this animal. One can retort that scaring these birds only transfers the problem to neighbours. This is true. But we can also imagine that allowing the dormitories to grow and prosper without doing anything is also a way of increasing the number of these birds. One of the solutions to rectify the rising population curve of these birds is the use of laser scaring on all the dormitories and also on the nesting sites.

**Second part: Cormorant (*Phalacrocorax carbo*) scaring tests in Italy during the winter of 1995–96**

**5. The use of lasers for bird scaring**

The province of Modena is situated in the interior of the southern part of Italy and, for a few years, it has been confronted during winter with the presence of several groups of Cormorants, a species which is particularly protected by law and the hunting of which is naturally outlawed. Unfortunately, during the day these groups frequent a hundred or so artificial lakes, of 1 to 20 hectares, used by fish farmers for intensive or extensive breeding of fresh water fish species (*Cyprinus* and *Istalurus*). We also have the problem of urban starling (*Sturnus vulgaris*) dormitories. That 's why, guided by the bibliography of the sector, we chose to try the use of laser instruments which, at that time, were particularly used on Cormorants. Later, the availability of two instruments, especially rented for use on starling in urban settings, allowed us also to carry out tests on cormorants, whether in my province or elsewhere following the proposition of tests by a technician from the wildlife sector or the fish farming sector.

The first tests were carried out outside the Modena province, on the Venice Lagoon, the Po Delta and in Toscany. In all these cases the scaring tests were carried out on Cormorants (and other species) during the midday rest on Cormorants who were fishing on a vast lagoon intended for extensive fish farming or who were already on the nocturnal dormitory.

The two nocturnal dormitories subject to scaring are: a dormitory in the Po Delta (Sacca di Scardovari Lagoon) and the other in Toscany.

The first was a dormitory frequented by more than a thousand Cormorants who used a mullet breeding zone, placed in the middle of a vast lagoon. This obliged us to recognise the dormitory on 29 November 1995, during the night, with a little surveillance boat equipped with radar. In this case, the test was only carried out that night with few laser shots, in the presence of a very thick mist which meant that the boat had to be guided by radar. The dormitory was thus recognised and some shots were effected which provoked the flight of all the birds, who were followed on the radar until they went to the northern part of the lagoon. A few days later, the people responsible for the surveillance told us that the birds had formed three groups who slept far from each other and were nervous and worried when they saw boats approaching.

A few days after the Scardovari test, we considered a different situation, since the second dormitory was in Toscany, in the middle of a forest (of Mediterranean oak) on the side of a wide canal. In this case the dormitory was scared while it was forming in the afternoon. Indeed, we had already noticed that it was possible to use laser emission during the day, if there were special light characteristics: sunset approaching, thick and low clouds, rain, mist, etc. In this case we waited until there were enough Cormorants and that the number of those approaching was increasing and then we carried out shots either on the birds already settled or no those approaching. The results was the complete flight of

the dormitory and the flying away of those who were approaching.
Again in November 1995 near the Venice Lagoon, the laser was tested on Cormorants and fish farm birds who frequented a private lagoon specializing in extensive fish farming and duck hunting. The problem posed by the owner was to scare away the birds who ate the fish without scaring away the wild ducks on the ponds. The shots were carried out during the day, in the afternoon in the presence of low clouds (well covered sky). We observed that the Cormorants and ashen herons flew away one by one. The results were immediate and selective for the Cormorants and herons.

On 23 December 1995 the scaring of Cormorants and herons was successfully tested on an extensive fish farm, situated on the northern part of the Venice Lagoon, where the manager needed to scare birds during the day but with a great selectivity so as not to scare the thousands of wild ducks in the immediate neighbourhood of a hunting reserve. In this case we were able to verify that what would have been really effective would have been to co-ordinate the use of the laser on the whole of the Venice Lagoon and not only on one part because this provoked the dividing up of the flocks of Cormorants between the other fish farms. We were able to observe that the lack of co-ordination between the fish farmers was the factor which stopped the results being better.

From the end of January until the first days of February 1996, we considered two Cormorant dormitories, situated to the East and West of Modena. The two dormitories had already formed during the winters of 1994–95 and 1993–94; the maximum number of birds had increased and the dormitory comprised about 180–210 birds in the East and 370–410 in the West.
The scaring of the two dormitories led to two different actions with special methodology.

The first was situated on private land, on a poplar plantation near a small artificial lake whereas the other one was situated on tens of poplars on a gravel island in the middle of an artificial lake of about 100 hectares in a regional protection reserve. Laser scaring had an immediate and lasting effect, and indeed, after three evenings, the dormitory was abandoned and remains so now. In this case we should note that the officers who carried out the scaring were next to the dormitory, almost underneath, and the last night real shots were also used (without killing or wounding) against the birds who escaped very high.

In the second case it was necessary to shoot from about 160 m from the islands where the Cormorants were already in the dormitory. Six or seven scarings were carried out from sunset until about one hour after sunset and we saw that the birds escaped in different directions but also that they executed large circles to try to return to the same trees, perhaps since there was no identical alternative in the vicinity. The following year the dormitory was still in the reserve but with less birds for a large part of the winter. From February 1996 the number increased again. It should by noted that the administration of the reserve didn't want to continue the scaring of Cormorants under the pretext of the necessity to offer the birds alternative places to sleep and fish without being scared, so as to avoid them frequenting and provoking damage to private fish farms.

Finally, we followed laser applications where other people were concerned by the damage provoked by wild bird dormitories in factories, vehicle depots, airports especially on the species *Larus sp.* and *Sturnus vulgaris.*

**6. Conclusion**

For bird scaring, up until now in the Modena Province (Italy), lasers classed as 3B and 3A by the EC standard have been successfully used and this especially for regularly scaring away starlings *(Sturnus vulgaris)* of the urban region of the town of Modena. In this case we ela-

borated a strategy which used knowledge of several factors which have an influence on the starlings and on the real possibility of making them go away: situation of the dormitory, the existence of desirable alternative dormitories or not, alternatives exploitable by the birds, factors which favour the dormitories, co-ordinated use of several lasers, emission of alarm call, distress call and calls of specific birds of prey for starlings.

The tests carried out on Cormorants gave good results, similar to those observed by the French ONC (Bulletin mensuel de l'ONC n° 178, 1993). We have good reasons to believe that applications of lasers should be part of a strategy which chooses to apply the methodology to vast zones and envisages alternative dormitories, damage areas, ponds which are favourable for leaving the birds in peace, and also verifies the possibility of combining the use of a laser with the use of stimulations to add to the laser's effectiveness (real shots, alarm call, distress call, bird of prey calls).

**Summary:**

The present article explains the rudiments of this laser bird scaring technology, used in France since 1987 as well as in Italy, Spain and the United Kingdom. Available products, legislation and standards are discussed. How it works and its effects on birds are explained. In addition to the trials carried out since 1993 by the French national hunting agency in Vendée, the wildlife, hunting and fishing agency of Modena (Italy, Emilia Ramagna region), the first in Italy, has tested the effectiveness of laser scaring of starlings since October 1995 in the town of Modena. As for Cormorants, tests were carried out between November 1995 and February 1996 on a dormitory of the Po Delta, in the region of Veneto, two dormitories in the province of Modena and one dormitory of the Toscany region. The laser was also tested on three extensive fish farms to verify the possibility of getting results during the day. The good results obtained correspond to the desired effect and to the limits fixed by European Laws and directives: effectiveness, selectivity, no damage to the birds, economy. The use of laser scaring coupled with other means is also mentioned.

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