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STARLING ABATEMENT AT PIRINCLIK AIR STATION IN EASTERN TURKEY

L.S. Buurma & R. McKenna

ABSTRACT

Massive starling roosts near runways may pose a threat to aviation, especially when the birds perform their aerial display flights shortly before sunset. But also the droppings of hundreds of thousand birds may cause unacceptable hindrance, while the extra weight put on wires and installations may result in serious damage. This report illustrates the problems and possibilities encoutered at the US air station Pirinclik in Eastern Turkey where Asiatic starling populations traditionally roost in extreme numbers. Earlier measures taken to dislocate the birds failed. However, the abatement described here has proven to be succesful. Emphasis is put on the need to understand the behavioural aspects of communal roosting in the starling.

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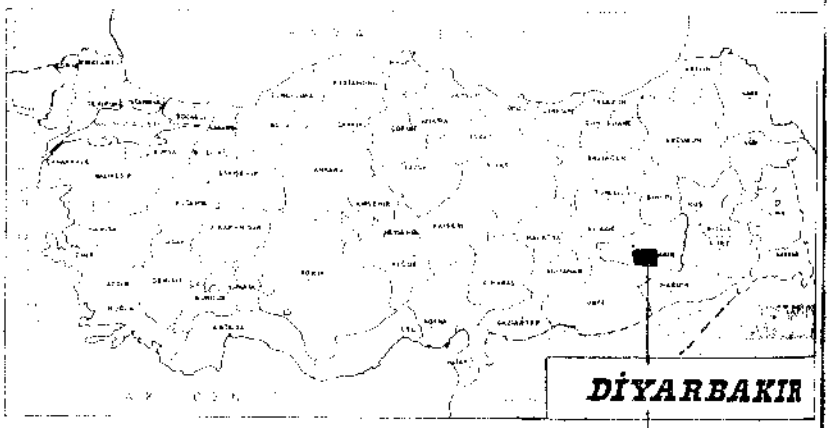

Figure 1: Maps of Turkey and the area around Dyarbakir
The asterix indicates Pirinclik Air Station

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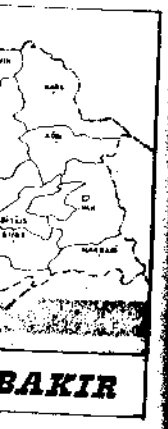

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1. Introduction

Since the early fifties starlings (Sturnus vulgaris) have caused problems at the US Air Station of Pirinclik in Eastern Turkey (figure 1). Pirinclik AS is located approximately 5 miles west of Dyarbakir, a city of about half a million inhabitants. The communications and radar installation (89 acres with 157 buildings) is located in an open area at 2805 feet MSL. It is close to the small village of Yolboyu. Starlings arrive at this remote place in late autumn coming from their Russian breeding grounds. Wintering numbers of birds seem to have increased, perhaps because of recent increased agriculture in the local area. At Pirinclik the Starlings have chosen the huge radar antennae as roosting sites. The maximum number spending the night there has been estimated to be as high as 3 million individuals! Noise, smell and droppings are the most frequent reasons for complaints. However, technical problems with the equipment, and even power failures have been directly attributed to the large roosts of these birds. Despite all the problems, many menbers of the station community still enjoyed the flocks during their aerial displays around sunset.

In the spring of 1987, the RNLAF was asked to consider the feasibility of sending a Dutch team of bird controllers to abate the starling roost. To determine the magnitude of the effort and to answer the question whether the Starlings have alternative roosting sites, a study visit was conducted by the authors during the last week of October 1987. The positive results from this visit led to the follow-on campaign by an eight member team from 5 till 25 November 1988.

The year in between appeared to be essential for the formal arrangement between US, Dutch and Turkish authorities for the purchasing of equipment and for the transportation of

all materials to Pirinclik. A real bottleneck was the import of searing cartridges ("ammunition") and flare pistols ("weapons") by an US transport aircraft crossing Greek airspace.

This report summarizes the history of the bird problem at Pirinclik, some aspects of starling biology and the observations of distribution of roosts and flight lines around Dyarbakir and Pirinclik, and finally the set-up and results of our campaign. As starling roosts can pose serious hazards to aircraft and therefore cannot be allowed near airfields, the abatement set-up described here may serve as an example.

2. Acknowledgements

The authors wish to thank HQ USAFE in Ramstein (Germany) and US Space Command for their trust in the RNLAF "Starling Abatement Team", and all team members (A.M. Arnold, L. Bergman, H. de Groot, T.E. van Klaveren, F.T.W.M. Lelieveld, H.G.V. Linckens) and in particular A. Dekker for their professional work. At the Air Station both commanders (Col Wyrar, USAF and Col Hayreter, TAF) and the civilian chiefs (mr Cherry, Schickelmann, Askoy and Thomas) were most cooperative. Special thanks go to Mr Lew Ryan (dep chief operations) and Capt Alf Trivette (civil base engineer) for their full involvement in the campaign.

3. History of the Starling problem at Pirinclik

Several trip reports of USAF biologists indicate that the starling problem has existed since the construction of the super structures in the early fifties. The general impression is that the birds arrive late October and that they reach peak numbers at the end of November. If the winter is not severe the birds may continue to roost at Pirinclik Air Station till February or March. However, when the ground is fully covered with snow or when the winter is particularly cold, they leave earlier. Therefore, some years have experienced worse infestations than others.

The long tenure employees at Pirinclik reported that many different methods including shooting with shotguns, broadcasting loud noise, ultra sounds and distress calls and using trained falcons had been tried without success. During the fall and winter of 1978-1979 over 100 trees were removed and others were heavily pruned. This did not stimulate the starlings to look for another sleeping place. During the winter of 1979-1980 the birds were unsuccessfully scared by spotlights at night and sprayed with water during cold nights. In 1985 a further pruning of trees followed, causing a further destroying of the ambiance of the station and loss of shade during the hot summer. In November 1985 a valiant attempt to use AFFF foam (a detergent in water) by the fire department to distress a few birds and have them disturb the main flock underscored the impracticality of this method.

Further discussions with the long tenure employees revealed that while many different techniques had been tried, none had been done persistently. Furthermore, past efforts were too general and too oriented towards chemical pest control measures. This might have been caused by the fact that the size of the problem was judged in a ambivalent way. Not only did the maximum number of starlings vary from winter to winter, but also did the willingness of the successive military commanders to enjoy and/or to hate the birds. The quick changes of personnel in the base staff also hindered a long term recognition of the problem.

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4. General remarks on the Starling

Figure 2 gives am impression of the different subspecies of the starling in the old world and a rough indication of their flyways during the seasonal migration. The map indicates that starlings passing through Eastern Turkey belong to the subspecies Sturnus vulgaris poltaratskyi, S. v. caucasicus and/or S. v. purpurascens. So far nobody has tried to find banded birds in order to check their recruitement areas. Judging from the numbers of dead birds that are usually found in and below the antennae (see photo) this could be a rewarding task!

The starlings are not breeding in the region. Among the local Kurdish people the starlings are known as "snowbirds" (kar kucu) because large populations arrive when the first snow falls. Part of the migrating population spends the winter around Dyarbakir, but many birds leave the area when it becomes really cold. Their final destination is the east Mediterranean region. Large midwinter roosts occur in Jerusalem and large numbers are eaten along the north african coast (Egypt, Lybia).

The reason that large populations of starlings stop to winter in the Dyarbakir region is the local agricultural developement. The areas very rich soil has been exploited by many old cultures for more than 4000 years. After a poor period, the land around the Euphrates and Tigris rivers is again undergoing rapid developement. Many natural areas are threatened but the starlings appear to have profitted from the increased human activity. Most probably they also stay here for longer periods than in the past. The roosting behaviour facilitates food finding (see chapter 5.1.) and the growing number of birds spending the night at Pirinclik Air Station can be seen as an indication of their increased presence around Dyarbakir.

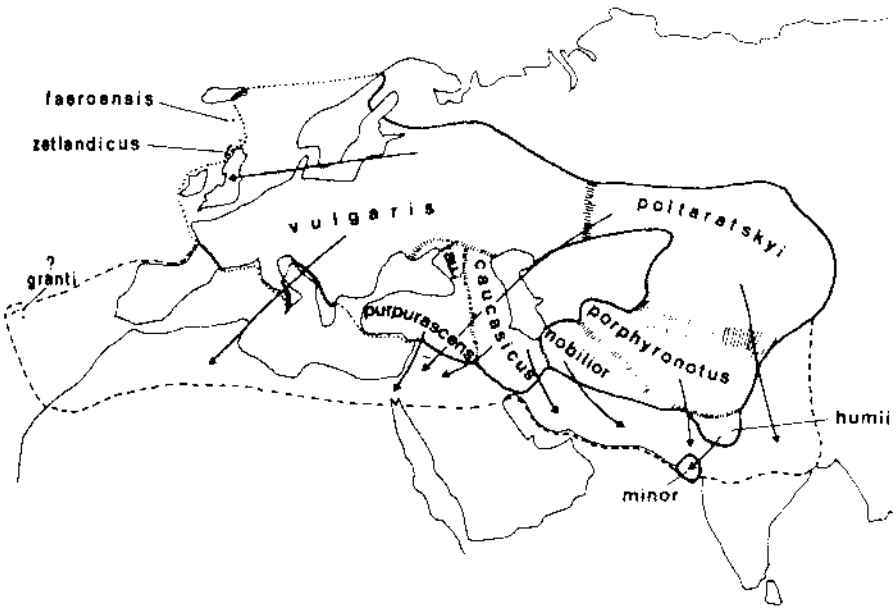

Figure 2: The breeding ranges of the subspecies of Sturnus vulgaris and their approximate directions of autumn migration. Hatched area's indicate zone of hybridization between subspecies (from Feare 1984).

5. Survey of the roosting behaviour

In this chapter we describe some recent literature on the roosting behaviour of the starling as well as report on our own first hand field oberservations. We refer to the book by Feare (1984), "The starling", published by Oxford University Press, UK for further reading and other literature references. Also Monograph No 23 of the British Crop Protection Council "Bird problems in Agriculture" (E.N. Wright ed. 1980) gives very valuable information.

5.1. Roosting behaviour in general

Bird are thought to roost communally for three reasons: conservation of energy, defense against predators, and transfer of information. Starlings try to protect themselves against wind and thereby reduce metabolic losses but whether they derive any benefit from the heat output of neighbours is moot. The energy saving that might be derived from roosting together certainly seems unlikely to be sufficient to offset the expenditure involved in commuting to and from distant feeding areas. Reduction of metabolic losses at night is not believed to be the ultimate factor responsible for the evolution of communal roosting behaviour (Feare 1984).

It also seems unlikely that social gatherings are always effective as defense against predators. In fact a traditional roost attracts predators and some birds of prey are real specialists in feeding upon the starling. Kestrels are very numerous at Pirinclik.

The modern hypothesis is that roosts primarily serve as information centers. Newcombers profit from the knowledge of birds that are already some time in the area by following them in the early morning. This however, is not yet explaning in detail the whole social affair. Furthermore, experienced birds have other interests and should try to avoid competition: why do they continue to visit the roost? Part of the answer may be the fact that the food itself has a highly unpredictable distribution. It appears in patches within the landscape, mainly due to agricultural activities. A permanent information exchange probably is an insurance for all the birds.

5.2. Starling Roosts in the Region

A very crucial question with respect of the chances of success for an abatement attempt is whether the birds have alternative places to sleep communally. In other words, to what extent are the starlings confined to the air station? Is it really the only suitable roosting site in the area? If it is not, what is the special attraction of these US super structures?

The first answers came already after three trips up to 30 miles from Pirinclik (towards NE, SE and WSW - see figure 1). Firstly, several suitable roosting sites were found i.e. small groups of reasonable high trees, tree plantations, small bushes etc. They were fairly scattered over a wide area, and partly invisible from the roads because many of them are situated in the lower areas (undeep valleys) below the plateau. Most potential roosts were found along the Tigris and close to and in Dyarbakir. A long talk with a farmer family in Hantepe made clear that the starling is very well known and, more important, that it is caught and eaten on a large scale. One of the catching technics is to blind the birds at night with a flash light and take them by hand or with a small net. Another possibility is the use of catapults, as we found out our selves when we discovered young boys shooting many starlings in the centre of the city at night in 1988.
From several talks with local (Kurdish) people we conclude that the starling is in fact a welcome extra source of protein. One "kar kucu" is worth about 10 Turkish Lira on the market. This in turn leads to our assumption that starling roosts have not much chance to settle at one particular place. Traditional (huge) roosts as they do occur in W. Europe would

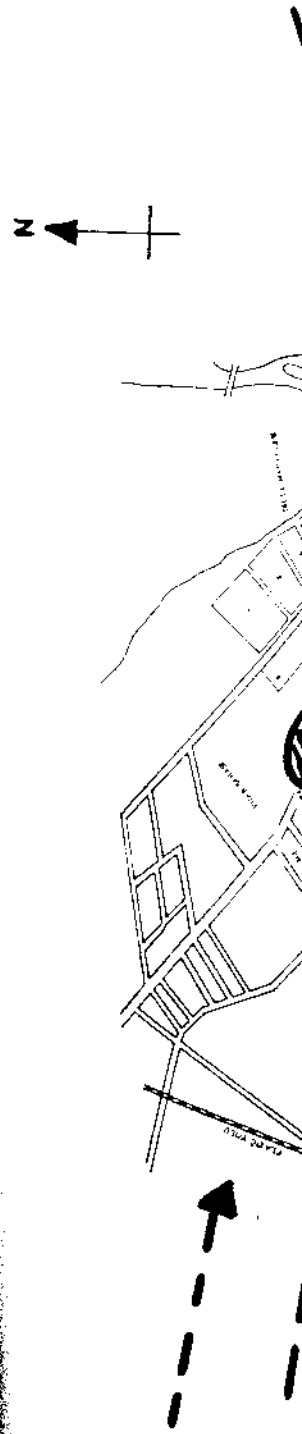

Figure 3: Flight directions, pre-assembly area, and roosts (shaded) of starlings in Dyarbakir

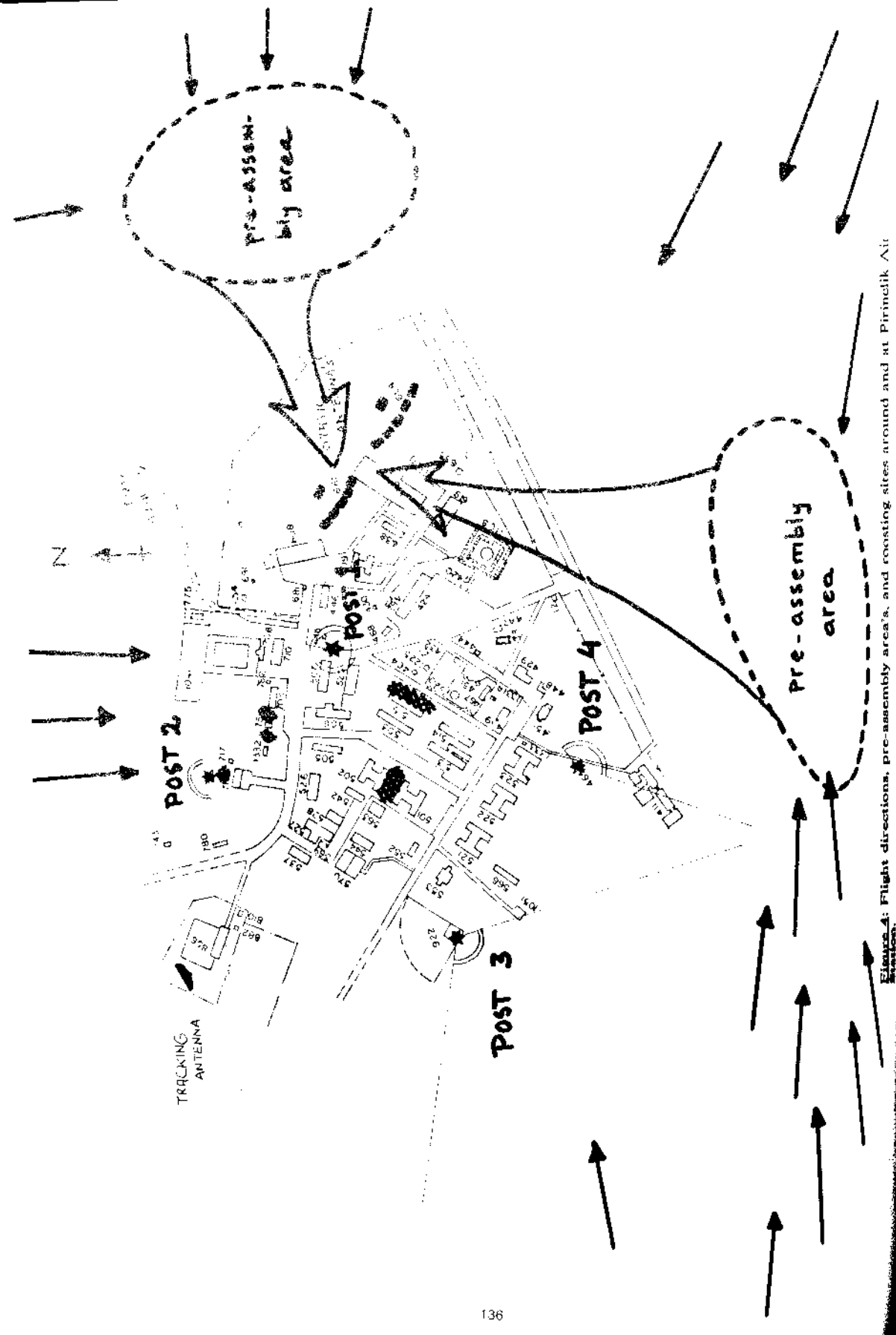

Figure 4: Flight directions, pre-assembly area's, and roosting sites around and at Pirinclik Air Station.

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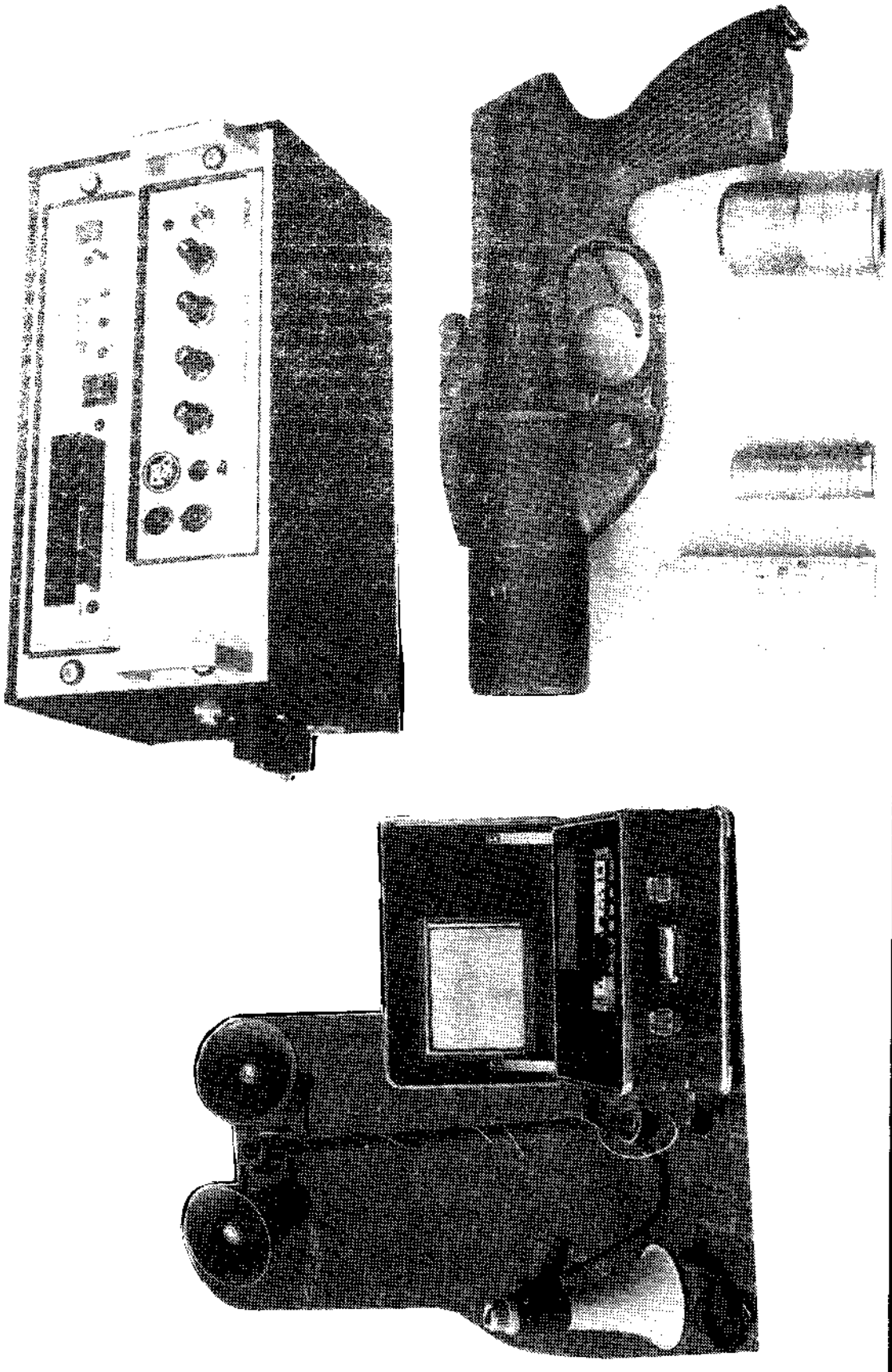

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an hour after sunrise, an massive exodus takes place after a sharp increase of calling activity. Different from the situation in Western Europe most of the birds leave in a big stream into one direction, soon followed by another big exodus. Simultaneous departures in all directions (producing nice ringlike echo's on radar screens, see the book "radar ornithology" by Eastwood 1967) could be observed only to a limited extent.

6. The Abatement of the Starling Roost

6.1. Principles

We have used the technics and followed the procedures which are practized when we dislocate starling roosts in Holland. The proper use of a combination of loud bangs plus light flashes (bird scaring cartridges) and broadcasting of amplified distress calls usually leads to a complete displacement of the bird population within a few days. When planning the campaign three aspects were kept in mind.

a. Disturbance of information transfer: As was explained in chapter 5.1. recent theories on roosting behaviour emphasize the importance for inexperienced birds (newcomers, young ones) of finding the good feedings places by joining the flocks when leaving the roost in the early morning. Furthermore, there is a clear but by far not yet fully understood social process going on when the birds arrive (aerial displays) as well as when they depart (wave like exoduses). Probably it serves not only the information transfer but also helps to regulate the competition for food during the day. We believe that the scaring actions should disturb these social processes, and that it therefore is essential to extend the actions to the early morning, just before the departures.

b. Stress optimalization: Birds, as all living creatures, are highly adaptive, and soon become habituated to phenomena that do not pose a real threat. Even the physically intense scaring signals that we used act only as "superstimuli" when they cannot be mentally handled. Therefore, they should happen in logic sequences and time intervals but also should be as shocking and unpredictable as possible. Thus, silence intervals can be considered as important as the stimuli itself. Never should the scaring get a "automatic nature", become predictable by means of preceeding signals and originate from fixed locations.

c. Reinforcement of the feeling that the location is unsuitable: This takes time. Once the birds have been discouraged to settle, they will nevertheless remember the place and will inspect the situation again and again the first evening and time by time on consecutive days. Remember that the birds have no alternative during the first night. It is already too late to find and/or to fly to another roost. Overacting makes no sense during this first night of the campaign. It may even be wrong because the birds have to be in a reasonable condition to understand that something is really bad with the place. Overstressed individuals may learn nothing (and even kill themselves by flying against obstacles etc). One should keep in mind that we need knowledgeable (highranking) birds that teach new immigrants not to use the place. Especially in the gregarious starling most decisions are flock decisions. Flock behaviour enforces the learning process and enforced habituation is crippling the power of our scaring signals. However, socially enforced habituation can also be reversed. Once the flocks know the danger a few alarm cries will do the job and only need to be affirmed by loud bangs (or a very few real killings by shot-cartidges).

6.2. Equipment and Methods

The most fruitful method of "communicating" with the birds is the alarm cry or distress call. Although these terms are often used interchangeable (also in this report) they indicate in fact two levels of communication. Distress calls are weaker and more species specific signals, more apt to warn other birds than alarm cries which just express panic and pain. We have

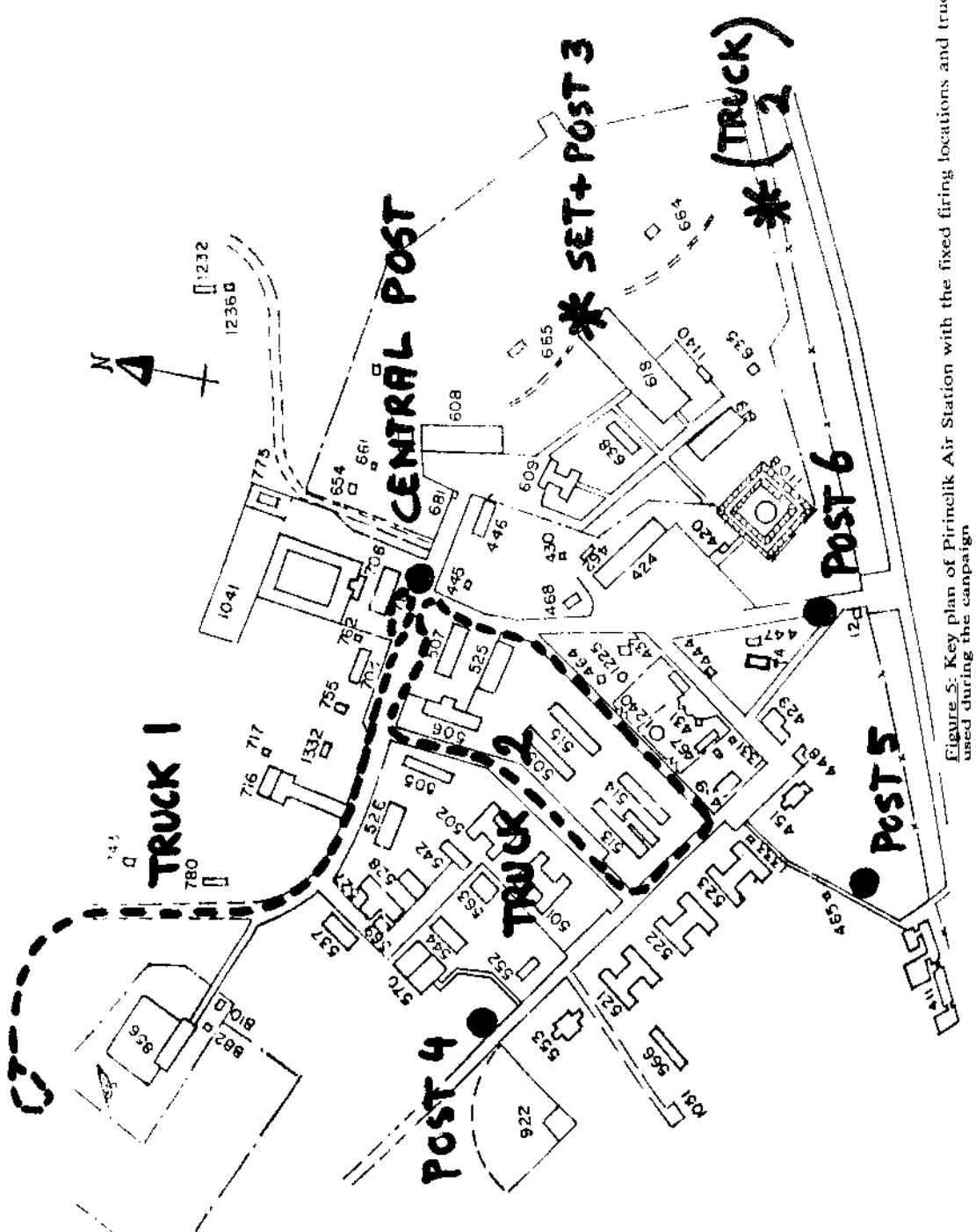

Figure 5: Key plan of Pirinclik Air Station with the fixed firing locations and truck loops used during the campaign

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not attempted to separate cries expressing different levels of emotion. During the 1987 survey some starlings were caught by means of mistnets between trees at the station. Cries were taken from the birds by pinching them in the legs. A long series of cries from 3 individuals was selected and put into a loop before it was copied on 10 tape cartridges.

Broadcasting was done by means of "bird scaring units" developed by the Dutch firm Redstar for the RNLAF (see photo's). The three units delivered to Pirinclik AS were used from cars. They also can be applied as stand alone systems, but this type of use should be avoided during the initial abatement of a starling roost. Although the broadcasting can be performed at random and in at random varying boutlength (both of course within certain limits) a fixed location was judged to be too risky with respect of habituation.

To enforce the frightening of the birds two types of bird scaring cartridges, also called shell crackers (see photo), were shipped in. The most heavy one is a 1.5 inch cartridge producing two loud bangs and an intense white flash. The interval time between the bangs is approx. 4.5 seconds. It is a type especially produced for use at airfields and has proven very effective. The only disadvantage is that it is really loud and may scare humans as well. Therefore we also used a smaller and cheaper cartridge (caliber 12) with a delay time of 3 seconds. Finally a few green and red flares (1.5 inch) were used, not only to further increase the frightening of the birds but also as warning signals for the team members firing from different locations.

The bird scaring cartridges were all fired by means of Verey flare pistols (photo). In order to shoot the smaller caliber 12 cartridges inserts were placed in the Verey pistols.
As a supplementary tool all team members used strong flashlights. Communication was possible by means of Motorola walkie talkies.

6.3. Time Schedule and Locations

The scaring actions were executed synchronically from four firing points and along two routes (figure 5). Three firing points were manned by one or two team members, using only a Verey pistol and flash light. One fixed firing point was between the two big radar antennaes where also one bird scaring unit was located. Two vehicles were driven slowly over the two fixed routes. Both had sound equipement onboard as well as one Verey pistol. If necessary one of the trucks spent some time at the SE corner of the station, between the fence near road to Dyarbakir and the most remote fixed antenna.

In order to synchronize the burst of action, even in case of malfunction of the radio's, a tight time schedule was agreed upon and all watches were time-checked. This daily schedule was briefed to US and Turkish commanders who than notified the human population of the base. Of particular importance was the notification of the defense patrols who might misunderstand the sudden "war time" conditions.

On the basis of the census of the influx of starlings during the first days of our presence we pinpointed the bursts of action at 16:15, 16:45, 17:15, 19:15 and 21:00. The early morning burst was fixed at 05:30. This early morning abatement remained fixed but the starting times of the evening actions during the following days were adapted a little bit depending on the behaviour of the birds. All actions lasted five to fifteen minutes.

6.4. The Campaign and Reactions of the Birds by Day

Due to the delay in arrival of the equipement we could not start the campaign until 19 November. Fortunately, it was also the first day with rain after several days with perfect weather for field observations. The wetness gave us a safe feeling with respect of the risk of fire (shell crackers), and made it easier to offer the starlings a really bad first night. Exactly at 16:15 the first flare was launched from between the two big antennae. The birds had already settled there and took off for a massive and impressive flight around and around the tall structures. They clearly attempted to reorder the movement by showing the typical aerial

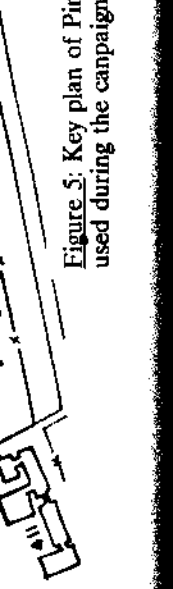

Figure 5: Key plan of Pirinclik Air Station with the fixed firing locations and truck loops used during the campaign

display maneuvering as they usually do before entering the roost at dusk. The following five minutes the birds were kept in the air by a few shell crackers from the different locations combined with intense broadcasting of distress calls from the driving trucks. As predicted, most of the birds landed somewhere within the station fence after the first burst ended, and many birds were reassembling at the antennae. A part of the birds may have escaped to the surrounding fields where we could not see them.
The second burst started at 16.45 when the starlings were barely visible due to the rain and dusk. This time, as well as during the subsequent actions, the anti-collision on top off the super structures were switched off, causing even more unsafe conditions for the birds. The starlings again performed a massive panic flight but the majority settled again on the antennae.

During the third burst at 17:15 it was clear that the birds that day had no possibilities to leave the place for another roost. Many birds flew criss-cross over the station while uttering short alarm cries.

During the following interval many birds were scared from the trees in the center of the station by handclapping of the team members to concentrate as many birds as possible on the big antennae. The fourth and fifth bursts were directed toward the antennae and again caused big panic among the starlings. Probably the majority of the birds entered the antennae again but many were dispersed all over Pirinclik and nearby Yolboyu. Many solitary birds were fluttering around while crying frequently. For a long time we heard birds up in the air. During the night the sky cleared and the temperature went rapidly down. The birds must have suffered a lot...

The following morning the birds were "kicked out their beds" at 05:30. Remarkably, the last flocks weren't very quick in leaving the place. Did they suffer too much or did the loss of a normal morning exodus derorientate them?

During late afternoon it became very clear that the first night of the campaign really had affected the birds. Their arrival behaviour indicated that they did not trust the site anymore. Several big flocks were seen simply passing Pirinclik, flying more or less parallel to the west-east road. Small flocks sailed above the station much higher and longer than normal. At 15:55 a first flock of over 1000 birds landed at the wave tube tower, but quickly flew up again. At 16:05 and 16:10 two big flocks came in from the preassembly area's south of the station and settled at the big antannae. Directly after the first shell cracker burst at 16:15 the birds flew up and splitted into much smaller flocks than during the evening before. These small but very dense flocks moved in remarkedly long and straight flights again and again over the station at high speed. The speeds were clearly higher than normal and the performances significantly deviated from the undisturbed aerial display flights. Nevertheless the birds flew with highly synchronized wingbeats. This suggests that new birds, not knowing about the disaster of the night before, are "told" that something is wrong by being socially pressed to flap their wings abnormally.

Only a very small number of starlings choose to land again at the antennae. The second burst of scaring activity instantaneously prompted the last birds to leave the station in one dense flock towards the Southwest.

The third action period was mainly directed at the big tracking antenna in the NW corner of the station. Here a few hundred starlings had hidden themselves in a clump against the backside of the aerial.

The following morning, November 21, we counted about 500 starlings closely packed at the same spot. At the wide static antenna only 200 birds were found. We were surprised by the relatively strong effect of the alarm cries compared to the flares this morning.

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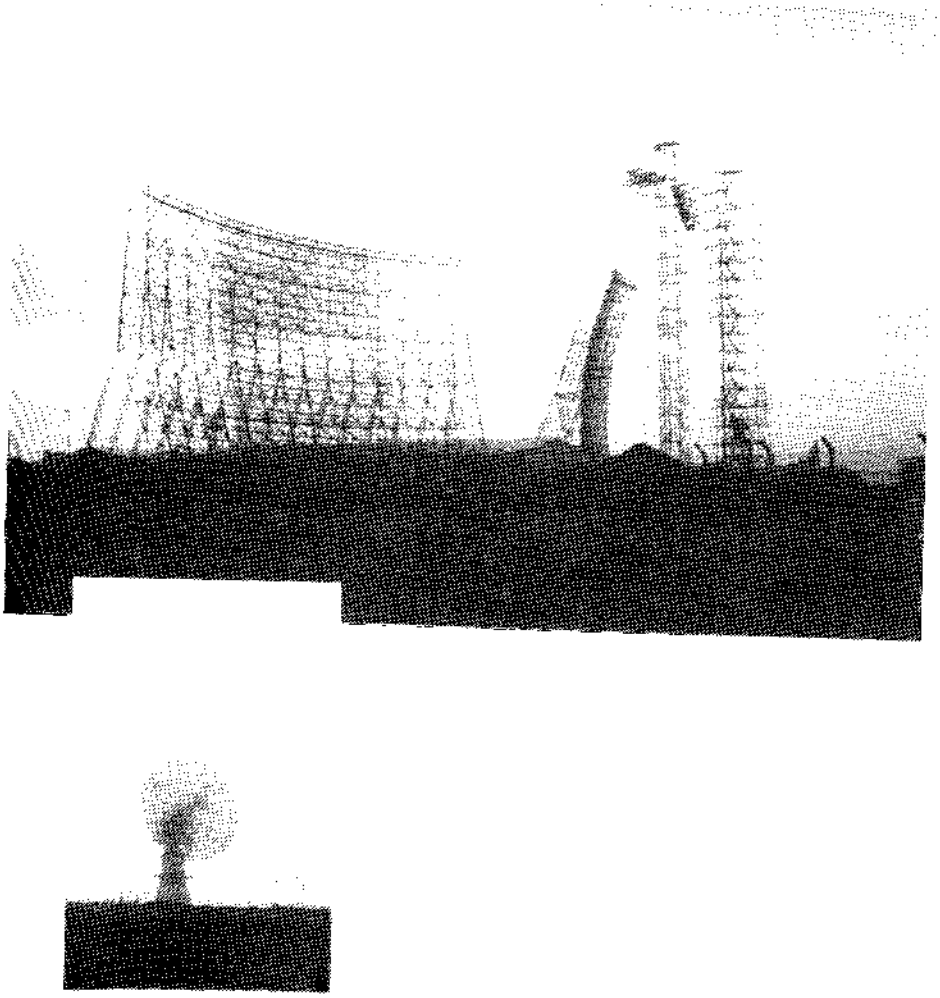
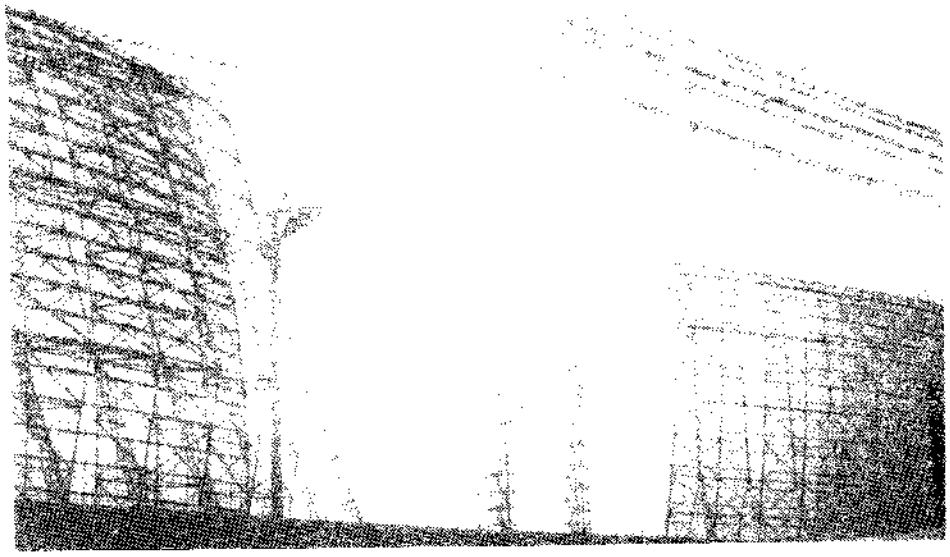
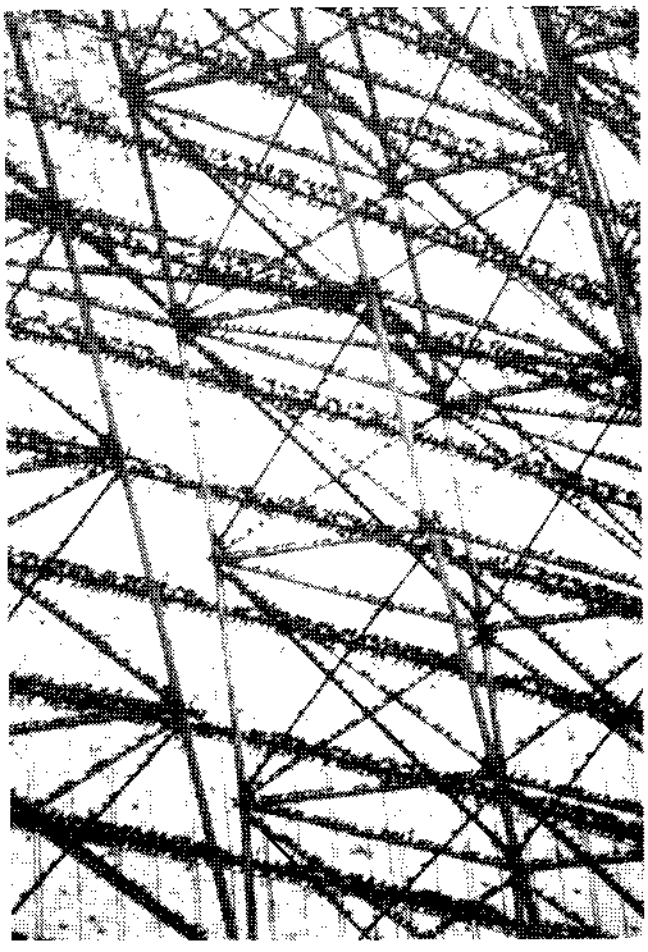


Two huge antennaes at Pirinclik, attracting over a million starlings in winter. Insert: the big tracking antenna, sometimes nearly underpowered due to the extra weight of tens of thousands starlings.



Starlings on the wires and in aerial display flight. A kestrel on top of a lamp post is watching them.



Starlings on the high antenna alive and dead. The bird bodies in the meshes were victims of a mass collision during a storm with rain.

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From 15:00 onward we started the evening actions according to a different strategy. In case a passing flock happened to land, it was directly chased again. This was primarily done by means of alarm cries. The bursts of heavy bangs were kept at the regular times but were kept limited in number of flares. More than 75 % of the passing birds came from the West and most of them flew high over without any hesitation. Some birds in the tail ends of the bigger flocks passing against sun set started to glide. This slightly slowed down birds in front of them. Usually one flare was enough to stop this process and speed up the continuation of the flight. Driving one truck around the whole station helped to scare birds passing the near vicinity. The total number of birds passing Pirinclik was again lower than the evening before. The next morning revealed only 150 birds at the tracking radar. They could easily be chased away and left the station eastward. Further, 6 starlings hid in a few solitary trees near the petrol station. They could not be chased.

During the evening there was again passage of some flocks of thousand birds or more but only very limited hesitating behaviour was observed. One shell cracker was necessary to remove a flock off the tracker. Mostly a short bout of distress calls was enough to end hesitation. Aerial display flights were virtually absent now.

On November 23 the early morning action was cancelled because of the succesful progress of the campaign. During the evening period a very limited amount of distress calls were sufficient.

Thanksgiving day, November 24, was celebrated with the whole station community and had an extra dimension for us. A short check of the starlings in the evening by four of us implied not much more than a "say hello" to some overflying flocks.

6.5. Final Results

A very few birds, possibly the local starling population living at the air station or in nearby Yolboyu, persisted to settle at the back site of the big tracking antenna. This was also the only place that (for security reasons) we could not reach with the flares. These birds which numbered about one hundred did not attract other starlings overflying the station during our last day.

Because of the remaining few birds (deviating in behaviour) and because of the starling roost population was not at full strength, we emphasized during our debriefing the need of further actions (see chapter 7).

From a letter from the Base Civil Engineer we learned that only few extra birds entered the station later on. Following our technic these starlings could be removed easily, leaving the station for the first time in 30 years free of starlings during the winter! Recently we heared that also winter '89/'90 has given no starling problems.

7. Proposed Future Countermeasures

As long as no new big roost has settled the responsible people should keep an eye open during the appropiate hour, between 16:00 and 17:00 in November, and, if necessary, scare away the
first arriving birds which will act as the nucleus for a new roost. It is most cost-effective to do this job when the starling population has not yet started to trust the roosting site again. Moreover, it saves expensive flares.

This is not meant to say that each incoming bird should be unwelcomed directly by bangs and cries. Let them explore the site in flight. The first arriving birds will take time for that.

this exploring behaviour costs energy and the more they have spent, the bigger the frustration that they finally not are allowed to settle.

The amount of alarm cry production should always be minimized. Don't broadcast continuously (bouts of a few seconds should do the job) and change position as much as possible. When the birds seem to become habituated to the alarm cries, then the time for heavier means has come. But use the bird scaring cartridges in a planned manner. Before using the first flare (which always will work) there is enough time to let a big flock settle. A good moment for the first flare is waiting until a new big flock is coming in. The flock that already settled will help you to discourage the newcombers. When they fly up after the first bang they give an extra signal to the newcomers. Don't use flares for scaring the last few birds in the darkness. The efficiency of the same flares will be much bigger the next morning and /or following evenings.

Reduce the use of 1.5 inch flares as long as the small cartridges do the job satisfactorily. However, once in a while beginning with one heavy bang enforces the surprise effect and enlarges the effectiviness of the small flares thereafter.

In case the roost has builded up big numbers, a real campaign as the one performed by us should be prepared. The following remarks should be kept in mind:

a. Don't worry too much about birds that settle during the first evening and keep the schedule of burts and silence intervals as planned;
b. Always repeat the action during the early morning (before the birds depart naturally);
c. Bad weather (drizzle) is excellent for the start of the campaign because it helps to let the night be very nasty for the starlings and it is also safe with respect of the risk of fire caused by the flares;
d. Have the equipment in perfect state (batteries fully charged), and check your watches in case of more patrols working simultaneously according to a time schedule;
e. Never panic and decide upon one or more stop signals (emergency);
f. Always notify people in the station and neighbourhood.

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