

# **Results of a study on the effects of model aircraft flying on breeding birds at New Ground Farm, Tring, Hertfordshire**

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## **Introduction**

This report gives the results of studies carried out in 2003 and 2010 on the effects of model aircraft flying on wildlife with particular emphasis on birds. Observations on other groups of animals as well as plants were also made. All information on plants and animals collected since 1995 is also included.

In order to quantify the size of the breeding bird population in the study area a mapping technique was used based on Common Birds Census methodology, whereby all the positions of territory holding birds were marked on a large-scale map of the area. Eight complete visits were made between 14<sup>th</sup> May and 11<sup>th</sup> July 2003 totalling 20.30hrs in duration. In addition a partial visit was made on 1<sup>st</sup> April for one hour. In 2010 eight complete visits were also made between 6<sup>th</sup> April and 6<sup>th</sup> July totalling 18 hrs 5 minutes in duration.

The number of territories was determined from the mapped distribution of registrations for each species using standard rules for analysis as recommended by the British Trust for Ornithology.

This method was used to look for differences in numbers of territories in relation to where the planes were being flown. Results of the census on that part of the site where model aircraft are not been flown can be used as a control for comparing with that part where they are, providing the habitat is similar.

Direct observations on the reaction of birds to the model aircraft being flown on site were also made.

**Table 1. List of bird species recorded and number of territories on land formerly part of New Ground Farm, Tring. 14.6 hectares April – July 2003 and April - July 2010.**

Species		2003 Territories		2010 Territories	
		Number	per 10ha	Number	per 10ha
Grey Heron	<i>Ardea cinerea</i>	P		P	
Mallard	<i>Anas platyrhynchos</i>	1	0.68	2	1.37
Red Kite*	<i>Milvus milvus</i>	0		1	0.68
Sparrowhawk	<i>Accipiter nisus</i>	0		P	
Common Buzzard	<i>Buteo buteo</i>	P		1	0.68
Common Kestrel	<i>Falco tinnunculus</i>	P		1	0.68
Eurasian Hobby*	<i>Falco subbuteo</i>	P		0	
Red-legged Partridge	<i>Alectoris rufa</i>	0		P	
Pheasant	<i>Phasianus colchicus</i>	2	1.37	2	1.37
Moorhen	<i>Gallinula chloropus</i>	2	1.37	2	1.37
Lapwing	<i>Vanellus vanellus</i>	P		0	
Common Tern	<i>Sterna hirundo</i>	P		P	
Stock Dove	<i>Columba oenas</i>	P		P	
Collared Dove	<i>Streptopelia decaocto</i>	0		P	
Wood Pigeon*	<i>Columba palumbus</i>	5	3.42	9	6.16
Green Woodpecker	<i>Picus viridis</i>	1	0.68	1	0.68
Great Spotted Woodpecker	<i>Dendrocopus major</i>	0		1	0.68
<b>Skylark</b>	<i>Alauda arvensis</i>	5	3.42	5	3.42
Swallow	<i>Hirundo rustica</i>	P		P	
House Martin	<i>Delichon urbica</i>	P		0	
Sand Martin	<i>Riparia riparia</i>	P		0	
Meadow Pipit	<i>Anthus pratensis</i>	1	0.68	1	0.68
<b>Yellow Wagtail</b>	<i>Motacilla flava</i>	0		P	
Grey Wagtail	<i>Motacilla cinerea</i>	0		P	
Pied Wagtail	<i>Motacilla alba</i>	1	0.68	1	0.68
Wren	<i>Troglodytes troglodytes</i>	9	6.16	8	5.48
Dunnock	<i>Prunella modularis</i>	9	6.16	11	7.53
Robin	<i>Erithacus rubecula</i>	9	6.16	13	8.90
Blackbird	<i>Turdus merula</i>	7	4.79	8	5.48
<b>Song Thrush</b>	<i>Turdus philomelos</i>	2	1.37	3	2.05
Mistle Thrush	<i>Turdus viscivorus</i>	1	0.68	1	0.68
Sedge Warbler	<i>Acrocephalus schoenobaenus</i>	P		0	

Common Whitethroat	<i>Sylvia communis</i>	3	2.05	6	4.11
Lesser Whitethroat	<i>Sylvia curruca</i>	1	0.68	1	0.68

Species		<b>2003</b> Territories Number per 10ha		<b>2010</b> Territories Number per 10ha	
Garden Warbler	<i>Sylvia borin</i>	P		0	
Blackcap	<i>Sylvia atricapilla</i>	2	1.37	6	4.11
Chiffchaff	<i>Phylloscopus collybita</i>	1	0.68	3	2.05
Willow Warbler	<i>Phylloscopus trochilus</i>	1	0.68	P	
Goldcrest	<i>Regulus regulus</i>	1	0.68	1	0.68
Long tailed Tit	<i>Aegithalos caudatus</i>	1	0.68	1	0.68
Coal Tit	<i>Parus ater</i>	1	0.68	1	0.68
Blue Tit	<i>Parus caeruleus</i>	6	4.11	8	5.48
Great Tit	<i>Parus major</i>	4	2.74	8	5.48
Magpie	<i>Pica pica</i>	3	2.05	3	2.05
Eurasian Jay	<i>Garrulus glandarius</i>	1	0.68	1	0.68
Eurasian Jackdaw	<i>Corvus monedula</i>	P		1	0.68
Rook	<i>Corvus frugilegus</i>	P		P	
Carrion Crow	<i>Corvus corone</i>	2	1.37	3	2.05
<b>Starling</b>	<i>Sturnus vulgaris</i>	P		2	1.37
<b>House Sparrow</b>	<i>Passer domesticus</i>	0		1	0.68
Chaffinch	<i>Fringilla coelebs</i>	12	8.22	14	9.59
Greenfinch	<i>Carduelis chloris</i>	2	1.37	2	1.37
Goldfinch	<i>Carduelis carduelis</i>	3	2.05	2	1.37
<b>Linnet</b>	<i>Carduelis cannabina</i>	3	2.05	1	0.68
<i>Bullfinch</i>	<i>Pyrrhula pyrrhula</i>	2	1.37	2	1.37
<b>Yellowhammer</b>	<i>Emberiza citrinella</i>	1	0.69	0	
<i>Reed Bunting</i>	<i>Emberiza schoeniclus</i>	P		P	
<b>Total density per 10 hectares</b>			<b>71.94</b>		<b>94.52</b>

### Key

P = Recorded on one or more visits but not believed to be holding territory although may be using the site for feeding.

Red List species are in **bold**.

Amber List species are in *italics*.

Wildlife and Countryside Act 1981 Schedule 1 species marked with an \*

**Summary of Table 1**

				<b>Average</b>
<b>Total number of territories</b>		105	138	121.5
<b>Total Schedule 1 List territories</b>	Marked with *	0	1	0.5
<b>Total Red List territories</b>	<b>In bold</b>	11	12	11.5
<b>Total Amber List territories</b>	<i>In italics</i>	15	17	16.0
<b>Total species</b>		49	50	49.5
<b>Total Schedule 1 species</b>	Marked with *	0	1	0.5
<b>Total Red List species</b>	<b>In bold</b>	5	6	5.5
<b>Total Amber List species</b>	<i>In italics</i>	6	6	6.0

National breeding bird monitoring schemes have found that many species of birds have declined markedly over the last 25 years. These have now been placed on Red or Amber Lists depending how bad the decline has been

The first quantitative assessment of the conservation status of the UK's birds was Batten *et al.*'s (1990) 'Red Data Birds in Britain' which listed 117 species which needed our care and attention. Since that time there have been three reviews of the status of birds in the UK. The first was published by the JNCC in 1996. Since then a number of once common species have shown further marked decline and were added to the agreed lists of species of conservation concern (Gregory *et al* 2002). In 2009 it was necessary to make further changes mainly because of the continuing deteriorating population status of many species of birds. (Eaton *et al* 2009). Some of the species found on the study site at New Ground are included in these lists. The relevant species of conservation concern are included in Table 2 together with the reasons for their inclusion.

**Table 2. List of bird species recorded on New Ground that receive special protection under the 1981 Wildlife and Countryside Act and Species of conservation concern 3.**

Species	Schedule 1 W&C Act 1981	Red List	Amber List	Criteria for inclusion
Red Kite	*		*	SPEC
Kestrel			*	SPEC
Hobby	*			
Lapwing		*		BDp1, SPEC, BDMp2, WI
Common Tern			*	BL
Stock Dove			*	BI
Green Woodpecker			*	SPEC
Skylark		*		BDp2, SPEC, BDMp1
Swallow			*	SPEC
House Martin			*	SPEC, BDMp1, BDMp2
Sand Martin			*	SPEC
Meadow Pipit			*	BDMp1, BDMp2
Yellow Wagtail		*		BDp1, BDp2
Dunnock			*	BDMp1
Song Thrush		*		BDp1
Mistle Thrush			*	BDMp1, BDMp2
Common Whitethroat			*	BDMp2
Willow Warbler			*	BDMp1, BDMp2
Starling		*		BDp1, BDp2, SPEC
House Sparrow		*		BDp1, BDp2, SPEC
Linnet		*		BDp2 SPEC, BDMp1
Bullfinch			*	BDMp1, BDMp2,
Yellowhammer		*		BDp1, BDp2
Reed Bunting			*	BDMp2

### Key to Red and Amber List criteria

#### Red List

- BDp1 Breeding population decline. Severe decline in the UK breeding population size, of more than 50% over 25 years.
- BDp2 Breeding population decline. Severe decline in the UK breeding population size, of more than 50% over the entire period used for assessments since the first Birds of Conservation Concern review, starting in 1969.

## **Amber List**

BDMp1	Breeding population decline. Moderate decline in the UK breeding population size, of more than 25% but less than 50% over 25 years.
BDMp2	Breeding population decline. Moderate decline in the UK breeding population size, of more than 25% but less than 50% over the entire period used for assessments since the first Birds of Conservation Concern review, starting in 1969.
SPEC	Species with unfavourable conservation status in Europe. (SPEC= Species of European Conservation Concern)
BI	International importance. At least 20% of the European breeding population in the UK.
BL	At least 50% of the UK breeding population found in 10 or fewer sites.
WI	International importance. At least 20% of the European non breeding population in the UK.

## **Assessment of site for territory holding birds**

A total of 105 territories were detected on the whole site in 2003, which works out at a density of 72 territories per 10 ha. In 2010 a total of 138 territories were detected which works out at a density of 95 territories per hectare. It is difficult to compare this density with other agricultural land because the hedgerow and woodland along the canal supports a large proportion of the birds present and is not typical of farmland as a whole. In addition there are two wooded areas in the middle of the plot which support a variety of species. Only half the canal woodland is really on the study side of the canal. The shape of the study plot, being much longer than it is wide, will exaggerate the edge effect and give an artificially high density. However even if only half the territories wholly situated along the canal are counted, the density still works out at 56.8 per 10 ha in 2003, and 79.1 in 2010 which still exceeds the top end of the range of what has been found on farmland in the past.

In his review paper Williamson 1967 gave values of between 5.5-50.5 territories per 10 ha on farmland, although most fell in the range of 10-40. In 1969 two farms nearby, Pendley and Grove Farms received a breeding birds survey along the lines of New Ground. This was carried out in preparation for the Silsoe Farming and Wildlife Conference in July 1969. The results are published in the Conference Proceedings (Barber 1970). The total density of breeding birds then, when farmland bird populations were higher, was 43.3 pairs per 10ha involving 46 species.

As the New Ground site is no longer being farmed but is gradually reverting back to chalk grassland, the results of surveys carried out in the late 1960's on some local chalk grassland and scrub sites were also examined. At Ivinghoe Beacon 36 species gave a total density of 64.6 territories per ha. At Pitstone Hill the equivalent figures were 29 species and 54.7 territories per 10ha. (Williamson 1975).

A further analysis was carried out by dividing up the site into two. The top five hectares which are not disturbed, and the remaining 9.6 hectares, which include the flying area and car park as well as the access road to the flying area. The results of this analysis revealed that in 2003 26 species held territory in the top section with a density of 89 territories per 10ha, whilst the bottom section held 25 species with a total density of 61 territories per 10ha. In 2010 27 species held territory in the top section with a total density of 116.0 territories per 10 ha, while the bottom section also held 27 species with a total density of 84.2 territories per 10 ha. The difference may be exaggerated by edge effect and the large copse of trees in the top section. It does show that even the disturbed section maintains a very good population of birds.

Given these results there is no doubt that the study area does support a very good and increasing breeding bird population.

### **Notable species**

Since the first survey in 2003 there have been changes in the species on the Red and Amber Lists due to changes in the population levels of these species. The results of the 2003 survey have been changed to accord with the latest list.

In 2003 the site held a total of 11 territories from five Red List species. See Table 2 for criteria for each species included on the list. Of these Skylark, Song Thrush, Linnet and Yellow Hammer were holding territory. Starling also used the site for feeding but did not appear to be holding territory.

A further 15 territories of six species on the site are on the Amber List. These are Green Woodpecker, Meadow Pipit, Dunnock, Mistle Thrush, Willow Warbler and Bullfinch. In addition another six species on that list were recorded on or over the site on one or more occasions but were not believed to be holding territory. These were Common Kestrel, Lapwing, Common Tern, Stock Dove, Swallow, House Martin, Sand Martin and Reed Bunting. One Schedule 1 species, the Eurasian Hobby, was seen hunting over the area on the evening visit.

In 2010 the number of Red Listed species recorded increased to six with 12 territories between them. Of these Skylark, Song Thrush, Starling, House Sparrow and Linnet held territory whilst Yellow Wagtail was seen on only one visit and was believed to have been a passing migrant.

A further six species which held a total 17 territories on the site are on the Amber List. These are Common Kestrel, Green Woodpecker, Meadow Pipit, Dunnock, Mistle Thrush, and Bullfinch. In addition another five species on that list were recorded on or over the site on one or more occasions but were not believed to be holding territory. These were Common Tern, Stock Dove, Swallow, Willow Warbler and Reed Bunting. A few other species such as Mute Swan, several gull species and Swifts were seen flying high over the site but were not using the site in any way.

## **Comments on species**

### **Waterfowl**

At least two pairs of Moorhen had territories along the canal in 2003 but were not seen actually on site during the survey. In 2010 three were seen near the hedge in the middle of the site and two were seen on visit B on pools which had formed on the low lying ground in the two wooded areas. As the pools dried out the birds moved back near to the canal. They have also been seen on site in the past when some of the low lying areas were flooded.

A number of Common Terns were using the canal for feeding in both years and often flew across the site even when model aircraft were being flown. A Grey Heron was seen on one visit flying onto a branch in a tree by the canal in 2003. It was presumably feeding either in the canal and/or on the grassland. A Lapwing was on the flying area on one visit in 2003 and was seen there on another occasion by David Humphrey. None were seen in 2010.

Finally a Mallard was seen on three occasions on the site in 2003 between 14<sup>th</sup> May and 26<sup>th</sup> June and was considered to be breeding on or near the site. In 2010 there were more sightings with birds being seen on each of the first five visits. A pair frequented the pond in the wood on site at least until early May at least.

It is also known that Coots have bred on site when the fields adjacent to the canal were flooded in 2001.

### **Birds of Prey**

Although three species were seen in 2003, namely Common Buzzard, Common Kestrel and Eurasian Hobby, none were believed to be established on the site but were using the area for hunting. They were not seen to catch anything. Birds of prey were more frequent in 2010 with Buzzards seen on four visits. On two occasions birds were seen feeding on the mown field, presumably on earthworms.

Red Kites were seen on three visits and spent quite a lot of time soaring over the site hunting. On visit C a Red Kite was circling over the flying area when a model aircraft was launched. It showed no reaction to the aircraft until it flew within about 10 metres of the bird when it gave a brief roll and then kept on circling over the flying area.

Kestrels were seen on just two visits and a female Sparrowhawk on one visit when it was seen to fly into the central hedge where it was mobbed by several songbirds.



### **Pheasant and Red-legged Partridge**

Two pairs were using the area in 2003 and on 21 August a female and eight young pheasants were seen by David Humphrey, proving successful breeding from one of the pairs. Two pairs were also present in 2010 when a Red-legged Partridge was also seen on visit E.

### **Doves**

There was only one sighting of Stock Dove but Woodpigeons were frequently seen in 2003 and were distributed over the whole site with five territories and some additional birds. Much the same can be said for 2010 when Stock Dove and Collared Dove were seen on one visit each but the Wood Pigeons had increased to nine territories and up to 51 were seen feeding on the fields.

### **Woodpeckers**

In 2003 there was one territory of Green Woodpecker and this still existed in 2010 when birds were seen on all eight visits. Great Spotted Woodpecker was not recorded in 2003 but one territory had become established by 2010 with birds being seen on three visits in the northern area of the site.

### **Skylark**

Five territories of this Red List species were detected in 2003 and were well distributed over the site. Three of the territories persisted over the whole survey period and the other two over most of the season. Four of the territories were based around the flying area and on 4<sup>th</sup> July Skylarks were seen and heard singing whilst model aircraft were being flown and in the same airspace. The study was not able to determine if the birds bred successfully as the grass was too long but one bird was seen taking food to a spot in the grass on the 26<sup>th</sup> June just immediately outside the flying area.

There were again five territories in 2010 which is very encouraging considering how this species has declined. Four of the territories persisted over the whole survey period and the fifth still existed up to at least mid June.

### **Swallows and Martins**

In 2003 House Martins and Swallows were present on most visits but were not always noted down as they were flying around high over the study site. They may have been breeding in the nearby industrial estate and using the air space over the canal and Newground for feeding. A Sand Martin was seen on just one occasion. During the weekend of 16<sup>th</sup>-17<sup>th</sup> August about 100 House Martins were seen by David Humphrey to

land on the take off pitch and later on the central hedge. It seems likely that this was a large group of birds in the area gathering prior to starting their migration south.

In 2010 Swallows were seen feeding low over the survey site only on the last two visits. Again it is likely that they are breeding in the nearby industrial estate.

### **Pipits and Wagtails**

In 2003 one or both of a pair of Pied Wagtails were seen along the grass by the central hedge and on the flying area on every visit from 14<sup>th</sup> May when the first complete visit started. A young bird was seen nearby on 11<sup>th</sup> June, proving successful breeding. A pair of Meadow Pipits was established immediately adjacent to the short grassed flying area and maintained their territory through out the survey period even though planes were flown over their territorial space. A party of 12 Meadow Pipits were seen on 1st of April feeding on the flying area. These may have been mainly local birds prior to splitting up into pairs, as there were two other territories the other side of the railway line.

In 2010 a pair of Pied Wagtails were seen and believed to be holding territory from the 16<sup>th</sup> April until the 5<sup>th</sup> May but not subsequently. There was no evidence of breeding this year on site. A Yellow Wagtail was seen on visit C and was thought to have been a migrant. A Grey Wagtail was present on the last visit and probably normally frequented the canal. As in 2003 one pair of Meadow Pipits held one territory on site in the same position.

### **Wren and Dunnock**

In 2003 these were equal second most common territory holding species on the site with nine territories each. They were distributed over most of the area with the majority of territories bordering the canal. It was not possible to comment on their breeding success as no young birds were seen.

In 2010 there were one fewer Wren territories and this may have been due to mortality in the cold winter of 2009-10. All but two territories were along the canal. There were 11 Dunnock territories and the increase was due to more territories being established in the wooded areas away from the canal.

### **Thrushes**

This group includes Robin, Blackbird, Song Thrush and Mistle Thrush.

In 2003 Robin was the second commonest species along with Wren and Dunnock with nine territories distributed all over the area where there are hedgerows and trees. Young birds were seen in two of the Robin territories.

In 2010 the Robin had increased to 13 territories again making it the second commonest territory holding species. The extra territories were located along the canal and in the wooded area situated in the northern part of the site.

The seven territories of Blackbird, eight in 2010 were also well distributed over the area, but the two Song Thrush territories in 2003 were located in the northern part. In 2010 an extra territory was established in the southern part near the canal. No young birds were seen. The Mistle Thrush is an early breeder and the survey in 2003 did not start in time to cover its main song period. The observations consisted of birds feeding and collecting food on the short grassed flying area. The bird clearly had an active nest on 14<sup>th</sup> May as it was seen flying carrying food to the trees along the canal bank where the nest was presumably situated. In 2010 birds were recorded on three visits.

### **Warblers and Goldcrest**

Seven species of Warbler were recorded in 2003; five of these were certainly holding territory. The Sedge Warbler singing on 21 May was probably a migrant as it was not seen subsequently and the Garden Warbler was only recorded present for eight days and was not considered to have established a territory. Neither species were recorded in 2010.

The Chiffchaff in 2003, established a territory in the northern part of the area along the canal bank where there are most tall trees. In 2010 the number of territories had increased to three and again these were mainly seen along the canal in the northern section. The selection of areas for their territories reflects the Chiffchaff's preference for sites with more mature trees.

The single Willow Warbler territory occupied a section of the canal bank in the southern part of the site. In 2010 Willow Warblers were seen on only one visit and did not establish a territory. This reflects the continuing national decline of this species.

In 2003 at least two of the three pairs of Whitethroat had got to the stage of hatching young as they were seen collecting food from late June. In 2010 the number of territories had doubled and these were mainly based on areas where tall trees were scarce or absent. This reflects this species preference for hedgerows and patches of scrub.

The Lesser Whitethroat was based along the central hedge and in the south-west corner in 2003. A bird was also heard singing on 11<sup>th</sup> June along the northern part of the canal but did not stay in this area. It may have been a wandering bird or the territory holder exploring further afield. There was no evidence that this bird was mated. Lesser Whitethroats were heard singing only on two visits spaced six weeks apart in 2010. One of the song records came from the central hedge and one nearby from a scrubby patch near the canal.

The only other warbler was the Blackcap. There were two territories in 2003 both in the northern section where there are more trees, reflecting this species habitat preferences. The male in the corner of the site was certainly paired as the female was seen twice but it is not known if either bird nested successfully. In 2010 there were six Blackcap territories with five situated in the north section where there are more trees. An additional territory was also established in the south west corner.

A pair of Goldcrests was established in both years, in the top corner where there are a few conifers.

## **Tits**

Four species of tits were found to be holding territory in both years, one each of Coal Tit and Long Tailed Tit were both in the northern part of the New Ground field in 2003 however the Long-tailed Tit moved its territory further south along the canal woodland in 2010. The Great Tits and Blue Tits which increased the number of territories from four to eight and six to eight respectively from 2003-2010 were distributed over the whole site including the central hedge and the small copse near the take off and landing area. At least four out of the six Blue Tits fledged young in 2003 and five out of the eight did so in 2010. Only one pair of Great Tits was known to have done so in 2003 but four out of the eight did so in 2010.

## **Crows**

Five species of Crow were seen but only Magpie, Jay and Carrion Crow were holding territory in 2003. The Jay was confined to the canal bank but the three pairs of Magpie divided the site up between them and were often seen feeding and fighting on the short grassed flying area. One of the two pairs of Crow certainly bred successfully rearing two young. These were often seen feeding near their parents on the flying area. They ignored a model aircraft flying overhead even when it passed within forty feet of them.

Rooks and Jackdaws, although not established on the site, congregated on the short grass of the flying area to feed for a while in early July when up to 80 Jackdaws and 100 Rooks were counted. Over 300 Rooks have also been reported by David Humphrey about that time in 2001. Small numbers were also occasionally seen at other times.

In 2010 Magpie, Jay and Carrion Crow again held territory. There was also a Jackdaw territory established and an adult and three young were seen on the last visit. Unlike 2003 when there was a flock of Rooks and Jackdaws on site in late June six Jackdaws and 23 Rooks were the maximum counts of feeding birds in 2010.

## **Starling**

No Starlings were detected breeding on site in 2003, but the short grass flying area attracted up to 200 adults and young of this Red List species in mid May until mid June building up to the peak on 11<sup>th</sup> June.

Although two pairs of Starlings held territory and reared young in 2010 there were no large feeding flocks in summer as in 2003.

## **Finches**

Five species of finches were recorded both in 2003 and 2010 with a combined total of 22 and 21 territories respectively. Chaffinch was the commonest territory holding species on the study area in both with 12 and 14 territories. These were distributed over the whole site where there are hedgerows and trees but little information on breeding success is available as no family parties were seen in 2003 and only one in 2010.

In 2003 one of the three Goldfinches bred successfully as a family party was seen. Two pairs held territory in 2010 but no young were seen. One of the two Bullfinch pairs also bred successfully in 2003 as young were seen. In 2010 two pairs again held territory but no young were seen. No Greenfinch or Linnet young were seen in either year. Only one pair of Linnets held territory in 2010 compared to three in 2003. This reflects the continuing decline of this species nationally. Because of the mobile nature of Linnets and Goldfinches and the colonial nature of the former it was not possible to delimit their territories. Linnets were seen feeding on the flying area in 2003, when a flock of 44 Linnets were counted on 14<sup>th</sup> May prior to them dispersing to take up territories over a wider area. There were no such gatherings in 2010.

### **Buntings and House Sparrow**

A Yellowhammer was present in 2003 and often singing throughout the season in the corner, left of the main gate, but no young were seen. None were seen at all in 2010. There was also a record of a male Reed Bunting on one occasion in 2003 in that corner and a bird was also seen singing the other side of the railway a week before. It seems likely this was a wandering male as it could not be found subsequently. There was a single bird in song on visit E near the canal in 2010 but this was not heard subsequently.

No House Sparrows held territory in 2003 but one territory was established in the South West section in 2010 from at least 6<sup>th</sup> April until 18<sup>th</sup> May. There was no evidence of breeding.

### **Intensity of model aircraft flying on the site**

The results of the breeding birds survey need to be evaluated in relation to the current level of flying activity in the study site. **Table 2** contains the results of an analysis of the flight log from mid April to mid July in 2003 and 2010, which covers most of the breeding season. Whilst territories were being established by the resident species, flying activity was low in 2003 but this increased as the spring and summer progressed. It reached a peak in the period analysed from mid June. In 2010 flying activity was high from the beginning of the breeding season and remained at a significantly higher level than in 2003 for the rest of the breeding season.

In 2003 visits were made on 53 out of the 88 days (60%) between 18<sup>th</sup> April and 15<sup>th</sup> July. Members were present on site for a total of 241 hours 15 minutes. On flying days people were present 4 hours 23 minutes on average and the average time when planes were in the sky was 1 hour 53 minutes per flying day. On the busiest days people may be present up to 11 hours and over eight plane hours flown, such as on June 21<sup>st</sup>.

In 2010 visits were made on 74 out of the 88 days (84%) in the same period. Members were present on site for a total of 458 hours and 25 minutes. On flying days people were present 5 hours 56 minutes on average and the average time when planes were in the sky was 2 hours 46 minutes per flying day.

In addition to flying activity, mowing of the take off and landing and the rest of the flying area takes place every week or so in summer.

It is clear from these results that there has been a 1.9 times increase in the hours members spent on site in 2010 (458hrs.25min) compared with 2003 (241hrs. 15 min). The number of hours flying time more than doubled from 105 hrs 46 min in 2003 to 213 hrs 14 min in 2010.

However, despite this increased intensity of use there was an increase from 105 to 138 breeding bird territories detected from 2003 to 2010 on the site. It is clear that the increased level of intensity of use is still compatible with the site maintaining a good breeding birds community with 49 species in 2003 and 50 in 2010.

**Table 3 Results of Analysis of Flight Log for intensity of use in 2003 and 2010**

<b>Period 2003</b>	<b>Number of days</b>	<b>Number of days visits made</b>	<b>Total hours when people present</b>	<b>Total hours flying time</b>	<b>Average time when people present per day</b>	<b>Average total flight time per day</b>
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18/4-30/4	13	6	9hrs 35min	2hrs 5min	0hrs 48min	0hr 10min
01/5-15/5	15	8	36hrs 10min	14hrs 30min	2hrs 25min	0hr 58min
16/5-31/5	16	9	38hrs 45min	19hrs 13min	2hrs 25min	1hr 12min
01/6-15/6	15	10	53hrs 45min	21hrs 08min	3hrs 35min	1hr 25min
16/6-30/6	15	11	52hrs 45min	26hrs 03min	3hrs 31min	1hr 44min
1/7-15/7	15	9	51hrs 20min	22hrs 47min	3hrs 25min	1hr 31min

<b>Average time when people present per flying day</b>	<b>Average total flight time per flying day</b>
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18/4-30/4	1hrs 36min	0hrs 20min
01/5-15/5	4hrs 31min	1hrs 49min
16/5-30/6	4hrs 18min	2hrs 08min
01/6-15/6	5hrs 23min	2hrs 07min
16/6-30/6	4hrs 48min	2hrs 22min
01/7-15/7	5hrs 42min	2hrs 32min

<b>Period 2010</b>	<b>Number of days</b>	<b>Number of days visits made</b>	<b>Total hours when people present</b>	<b>Total hours flying time</b>	<b>Average time when people present per day</b>	<b>Average total flight time per day</b>
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18/4-30/4	13	12	77hrs 00min	38hrs 40min	5hrs 55min	2hrs 58min
01/5-15/5	15	12	64hrs 00min	21hrs 28min	4hrs 16min	1hr 26min
16/5-31/5	16	14	94hrs 00min	48hrs 26min	5hrs 53min	3hrs 01min
01/6-15/6	15	13	86hrs 45min	49hrs 10min	5hrs 47min	3hrs 17min
16/6-30/6	15	11	92hrs 50min	33hrs 09min	6hrs 11min	2hrs 13min
01/7-15/7	15	12	43hrs 50min	22hrs 21min	2hrs 55min	1hr 29min

<b>Average time when people present per flying day</b>	<b>Average total flight time per flying day</b>
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18/4-30/4	6hrs 04min	3hrs 13min
01/5-15/5	5hrs 20min	1hrs 47min
16/5-30/6	6hrs 43min	3hrs 28min
01/6-15/6	6hrs 40min	3hrs 47min
16/6-30/6	7hrs 08min	2hrs 33min
01/7-15/7	3hrs 39min	1hrs 52min

## **Reactions of birds to activities on site**

When people appear on site most birds which are feeding on the short grass flying area leave even before planes are being flown. Some species may stay and it has already been mentioned that a family party of Carrion Crows ignored the plane even when it flew within forty feet of them. On visit C in 2010 a Red Kite was circling over the flying area when a model aircraft was launched. It showed no reaction to the aircraft until it flew within about 10 metres of the bird when the bird gave a brief roll and then kept on circling over the flying area.

A territory holding Skylark adjacent to the flying area carried on singing whilst planes were being flown. It would appear that the present level of activity is not enough to cause desertion of adjacent territories of Skylark or Meadow Pipits which are field species, as the mapping census showed that they maintained their territories throughout the survey period.

Some of the feeding birds such as Magpie, which left the immediate flying area, were seen to return within 10 minutes after flying was over. On one occasion, when flying took place between 17.20 and 17.50 on 3<sup>rd</sup> July, about 80 Jackdaws and 100 Rooks were feeding in the flying area at 09.15 am the next morning; however it is not known how soon these arrived after flying ceased. They left again on my arrival and did not return while I was present on site.

Species which held territory in the hedgerows on site as well as in the copses and along the canal bank appeared not be affected as they carried on singing when planes were in the air and most maintained their territories throughout the season.

It would appear that the present level of flying activity is compatible with territory holding birds being able to maintain their territories and observations showed that some species at least were able to breed successfully. Examples being Pheasant, Pied Wagtail, Robin, Mistle Thrush, Whitethroat, Blue Tit, Great Tit, Carrion Crow, Goldfinch and Bullfinch.

## **Results of a literature review on the effects of model aircraft flying on birds**

A literature review was carried out using the Zoological Record from 1986-2002 and an Annotated Bibliography on Human Disturbance to Waterfowl (Dahlgren & Korschgen 1992). Whilst many references exist which described the disturbance caused to birds by jet planes, helicopters, light aircraft and ultra light aircraft from Europe and North America, only one has been found covering model aircraft. This however involved deliberately flying aircraft at geese to scare them off farmland where they were grazing the crops.

Several studies have now found that the most widespread and long lasting disturbance to estuarine waterfowl (ducks, geese and waders) often comes from aircraft, and that the slower the aircraft the worst the disturbance. Helicopters, microlights and light aircraft disturb more than jets.(Koolhass *et al.*1993; Smit &Visser1993; Stock 1993). Small and slow flying aircraft are considered to be among the most disturbing phenomena in the



Wadden sea. Barnacle Geese (*Branta leucopsis*), at Caerlaverock on the Solway were sometimes raised by small aircraft at a distance of 1.6-3.2 km (Owen 1973) The behaviour of the plane and its altitude both govern the reactions of the birds: flying high in a straight line leads to smaller effects than flying low or with unpredictable curves. (Boer *et al* in Smit & Visser 1993).

Ultra light aircraft appear to be very disturbing, probably because of the low altitude at which these planes operate and the noise they produce. Numbers of roosting and foraging Bewicks Swans (*Cygnus bewickii*) close to an Ultra-light airstrip at Schouwen Duiveland (Delta area) dropped from 1,400-4,300 in 1986-88 to only a few birds in 1989, after the strip had been used for one year (Brilman in Smit&Visser 1993).

In the late 1980's, model aircraft were tested as a technique to scare geese off the most sensitive grassland areas on the Wexford Slob, Ireland. Deliberately flying model aircraft at the geese at low altitude (less than 25m) had major effects on geese, invariably flushing 80% of all geese within 500m. Flying at greater heights (up to 60m), all geese were flushed from an area of 500-800m and none returned within two hours, although some individually marked birds, which had been scared off, did return to their original feeding site later in the day. Geese took off low and flew at speed directly away from model aircraft and, on one occasion some were killed in collisions with overhead power cables (Walsh 1993).

Reactions can vary. Feral Canada Geese (which tend to be fairly tame in this country, unlike migratory geese), using a 400m lake running along the bank of the Breton's Model Flying Club, graze the take off and landing patch. They sometimes fly alongside the model aircraft, when they are flown parallel to the lake. The model is banked away from the birds after a few seconds; the birds (up to five together have been seen doing this) do not bank away from the model. (T. Rounce, pers. comm via R. Bellingham).

No reported studies of the effects of model aircraft flying on nearby breeding song birds could be found.

The model aircraft club in Roding, in North Bayern, Germany, reported two pairs of Curlew breeding near the mown flying field. The club moved their activities to avoid disturbing them. The next year the curlews had moved adjacent to the newly mown flying field the club had prepared and none were breeding near the old site, which was no longer being mown. It was concluded that mown sites provided better feeding facilities. The report in the R/C Model World for 1995 did not cover whether the Curlews remained to breed successfully, or whether the club moved back to their original site.

Apart from the German observations, this study has not been able to find any information on the reactions of breeding waders which tend to be sensitive on moorland or grazing marsh, or game birds such as grouse on moorland to model aircraft flying. No information could be found either on freshwater species although it is likely that waterfowl on freshwaters may have a similar reaction to aircraft to those on the coast and described above. Breeding waders are often sensitive to disturbance. (Sidaway 1990)

## Discussion and Conclusions

Whilst Starlings, Jackdaws and Rooks and some other birds would fly off from the New Ground flying area as soon as someone appeared they would come back sometime after flying ceased. The immediate source of disturbance in this case was the presence of people. An exception was a family party of Carrion Crows which stayed and took no notice of model aircraft flying to within forty feet of them. Field nesting Skylarks carried on with their song flight immediately adjacent to the flying area when aircraft were being flown. A Meadow Pipit although not singing when aircraft were in the air maintained a territory from at least mid May to mid July. The hedge and woodland nesting passerine population maintained most of their territories during this period.

Given the number of species and birds involved and the substantial increase in the number of territories detected in 2010 compared to 2003 no evidence of any detrimental impact could be detected on the birds of New Ground by model aircraft flying at the increased current intensity. The number of breeding species and density of territories compared very favourably with nearby farmland and chalk grassland and scrub areas, which had been studied in a similar way in the past.

The management regime involving regular mowing of a central area of grass to keep it short for take off and landing and for the wider flying area provided a good feeding area for birds.

It would seem that establishing model aircraft flying sites on farmland or other similar habitats, in lowland areas, where there are no breeding waders, should not pose any threat to breeding wild birds of the species covered in the New Ground site. This conclusion does not cover breeding waders, as these tend to be more sensitive to disturbance and further studies are needed to assess any impact.

The literature search found no reported studies, which attempt to quantify the incidental effects of flying model aircraft, on nearby water birds.

In the case of waterfowl species on coastal saltmarshes and fields, there is documentary evidence of a major impact if the model aircraft are used to deliberately scare birds. This has been provided by observations on the practice on the Wexford Slobs, Ireland, of using model aircraft to successfully scare geese away from sensitive grassland areas. This does not necessarily provide an indication of how birds would react to model aircraft being flown adjacent to their feeding sites rather than over them.

Establishing model aircraft flying sites actually on coastal fields or salt marshes where populations of waterfowl are present may pose a threat to these birds. The flying of model aircraft over them as an incidental result of the activity would have a similar effect as flying model aircraft over them to scare them away. The actions would be the same, and the geese would not be able to distinguish intentions!

The impact of establishing model aircraft flying sites adjacent to coastal fields, saltmarshes, lagoons or freshwater bodies, appears not to be documented and further studies are needed to quantify any impact.



No mammal trapping was carried out. This would have revealed the presence of additional small mammals such as shrews, voles and field mice.

Muntjac Deer	<i>Muntiacus reevesi</i>	one believed to be of this species reported by David Humphrey in June 2001. Two were seen on 16 <sup>th</sup> April 2010 in the clump of trees near to the flying area. One seen near the central hedge on 27 <sup>th</sup> April 2010.
Fox	<i>Vulpes vulpes</i>	Regularly seen on site.
Badger	<i>Meles meles</i>	An active set on site.
Stoat	<i>Mustela erminea</i>	One seen near entrance on 16 <sup>th</sup> April 2010.
Grey Squirrel	<i>Sciurus carolinensis</i>	Regularly seen on site.
Common Pipistrelle	<i>Pipistrellus pipistrellus</i>	(45kHz genotype)
Soprano Pipistrelle	<i>Pipistrellus pigmaeus</i>	(55kHz genotype)
Noctule/Leisler's Bat	<i>Nyctalus noctula/leisleri</i>	
Rabbit	<i>Oryctolagus cuniculus</i>	(including at least one black individual).

### Dragonflies

Common Darter	<i>Sympetrum striolatum</i>
Common Blue Damselfly	<i>Enallagma cyathigera</i>

### Butterflies

All the following species were seen in 2003 and again in 2010 except for Painted Lady. The total of 22 is about a third of the species occurring in the British Isles.

Small Skipper	<i>Thymelicus sylvestris</i>	Very common
Essex Skipper	<i>Thymelicus lineola</i>	A few seen in July
Large Skipper	<i>Ochlodes venata</i>	A few seen June -July
Brimstone	<i>Gonepteryx rhamni</i>	A few in May
Large White	<i>Pieris brassicae</i>	Regularly seen May-June
Small White	<i>Pieris rapae</i>	ditto
Green Veined White	<i>Pieris napi</i>	ditto
Orange Tip	<i>Anthocharis cardamines</i>	ditto
Small Copper	<i>Lycaena phlaeas</i>	A few in July
Common Blue	<i>Polyommatus icarus</i>	A few in June and July, common in August 2003
Holly Blue	<i>Celastrina argiolus</i>	A few in May and June
Red Admiral	<i>Vanessa atalanta</i>	Several in July
Painted Lady	<i>Cynthia cardui</i>	One on 8 <sup>th</sup> August 2003
Small Tortoiseshell	<i>Aglais urticae</i>	A few in July
Peacock	<i>Inachis io</i>	A few in July and 8 <sup>th</sup> August 2003
Comma	<i>Polygonia c-album</i>	Regularly seen July
Speckled Wood	<i>Pararge aegeria</i>	Common in June
Marbled White	<i>Melanargia galathea</i>	Very common from late June to August
Gatekeeper	<i>Pyronia tithonus</i>	A few in July to August 2003
Meadow Brown	<i>Maniola jurtina</i>	Frequent from mid June
Small Heath	<i>Coenonympha pamphilus</i>	A few 11 <sup>th</sup> July
Ringlet	<i>Aphantopus hyperantus</i>	Abundant late June to July, the commonest butterfly, still some on 8 <sup>th</sup> August 2003.

## Moths

Only a few day time flying moths were noted. For a detailed study it is necessary to use a moth trap over night on a number of occasions through out the spring to autumn seasons.

Chimney Sweeper	<i>Odezia atrata</i>
Six Spotted Burnet	<i>Zygaena filipendulae</i>

## Other invertebrates

The following have been recorded by Dr Ian Johnson:

Hover Fly	<i>Episyrphus balteatus</i>
Hoverfly	<i>Chrysotoxum bicinctum</i>
Bumblebees:	<i>Bombus pratorum</i>
	<i>Bombus lapidarius</i>
	<i>Bombus terrestris</i>
	<i>Bombus pascuorum</i>
	<i>Bombus lucorum</i>
	<i>Psithyrus vestalis</i>
Roesell's Bush-cricket	<i>Metrioptera roeselii</i>

Large numbers of Cantharid (soldier) beetles also noted.

## Plants

The following is a list of plants recorded by Dr Amanda Pierce in 1995. The list does not contain any indicator species of chalk grassland.

LATIN NAME	COMMON NAME
<i>Anthoxanthum odoratum</i>	Sweet Vernal-grass
<i>Arrhenatherum elatius</i>	False Oat-Grass
<i>Bromus hordeaceus</i>	Soft-brome
<i>Dactylis glomerata</i>	Cock's-foot
<i>Elymus repens</i>	Common Couch
<i>Festuca rubra</i>	Red Fescue
<i>Holcus lanatus</i>	Yorkshire-fog
<i>Carex hirta</i>	Hairy Sedge
<i>Anthriscus sylvestris</i>	Cow Parsley
<i>Cerastium fontanum</i>	Common Mouse-ear
<i>Cirsium arvense</i>	Creeping Thistle
<i>Cirsium vulgare</i>	Spear Thistle
<i>Convolvulus arvensis</i>	Field Bindweed
<i>Epilobium hirsutum</i>	Great Willowherb
<i>Galium aparine</i>	Cleavers
<i>Geranium dissectum</i>	Cut-leaved Crane's-bill
<i>Geum urbanum</i>	Wood Avens
<i>Glechoma hederacea</i>	Ground-ivy

<i>Heracleum sphondylium</i>	Hogweed
<i>Hypochoeris radicata</i>	Cat's-ear
<i>Medicago lupulina</i>	Black Medick
<i>Plantago major</i>	Greater Plantain
<i>Potentilla reptans</i>	Creeping Cinquefoil
<i>Prunella vulgaris</i>	Selfheal
<i>Ranunculus repens</i>	Creeping Buttercup
<i>Rumex acetosa</i>	Common Sorrel
<i>Rumex crispus</i>	Curled Dock
<i>Rumex obtusifolius</i>	Broad-leaved Dock
<i>Senecio jacobaea</i>	Common Ragwort
<i>Taraxacum officinale</i> agg.	Common Dandelion
<i>Trifolium repens</i>	White Clover
<i>Urtica dioica</i>	Common Nettle
<i>Veronica chamaedrys</i>	Germander Speedwell
<i>Veronica serpyllifolia</i>	Thyme-leaved Speedwell
<i>Vicia cracca</i>	Tufted Vetch
<i>Vicia hirsuta</i>	Hairy Tare
<i>Vicia sativa</i>	Common Vetch
<i>Clematis vitalba</i>	Traveller's-joy
<i>Crataegus monogyna</i>	Hawthorn
<i>Fraxinus excelsior</i>	Ash
<i>Prunus spinosa</i>	Blackthorn
<i>Rubus fruticosus</i> agg.	Bramble
<i>Sonchus asper</i>	Prickly Sow-thistle
<i>Sonchus oleraceus</i>	Smooth Sow-thistle
<i>Bromus sterilis</i>	Barren Brome
<i>Poa</i> spp.	Meadow-grasses
<i>Rosa</i> spp.	Rose
<i>Agrostis</i> spp.	Bent-grasses
<i>Chamaenerion angustifolium</i>	Rosebay Willowherb
<i>Hedera helix</i>	Ivy
<i>Myosotis arvensis</i>	Field Forget-me-not
<i>Stachys sylvatica</i>	Hedge Woundwort
<i>Alopecurus myosuroides</i>	Black-grass
<i>Aphanes arvensis</i>	Parsley-piert
<i>Papaver rhoeas</i>	Common Poppy
<i>Veronica persica</i>	Common Field-speedwell

Since 1995 Dr Ian Johnson recorded the following additional species on 19<sup>th</sup> May 1997,

<i>Euonymus europaeus</i>	Spindle
<i>Rhamnus catharticus</i>	Buckthorn
<i>Ranunculus bulbosus</i>	Bulbous buttercup
<i>Reseda lutea</i>	Mignonette

The Bulbous buttercup is an indicator plant species of chalk grassland.

On 8<sup>th</sup> August 2001 further species were recorded:

<i>Malva moschata</i>	Musk Mallow
<i>Lotus corniculatus</i>	Bird's-foot trefoil
<i>Trifolium pratense</i>	Red Clover
<i>Trifolium campestre</i>	Hop Trefoil
<i>Potentilla anserina</i>	Silverweed
<i>Pimpinella saxifraga</i>	Burnet-saxifrage
<i>Clinopodium vulgare</i>	Wild Basil
<i>Knautia arvensis</i>	Field Scabious
<i>Centaurea nigra</i>	Black Knapweed
<i>Centaurea scabiosa</i>	Greater Knapweed
<i>Carex hirta</i>	Hairy Sedge
<i>Carex flacca</i>	Glaucous Sedge
<i>Juncus inflexus</i>	Hard Rush

This list contains another five chalk grassland plant indicators. These are Burnet-saxifrage, Wild Basil, Field Scabious, Greater Knapweed and Glaucous Sedge. Further plant species were recorded in 2003 as part of the present study. These are:

<i>Oenothera biennis</i>	Small-flowered Evening Primrose
<i>Geranium molle</i>	Dovesfoot Cranesbill
<i>Torilis japonica</i>	Hedge Parsley
<i>Lamium purpureum</i>	Red Dead-nettle
<i>Origanum vulgare</i>	Marjoram
<i>Thymus polytrichus</i>	Wild Thyme
<i>Galium verum</i>	Lady's Bedstraw
<i>Leucanthemum vulgare</i>	Red Dead Nettle
<i>Centaurea nigra</i>	Common Knapweed
<i>Lapsana communis</i>	Nipplewort
<i>Leontodon saxatilis</i>	Lesser Hawkbit
<i>Dactylorhiza fuchsii</i>	Common Spotted Orchid
<i>Anacamptis pyramidalis</i>	Pyramidal Orchid
<i>Ophrys apifera</i>	Bee Orchid
<i>Arum maculatum</i>	Cuckoo Pint
<i>Equisitum arvense</i>	Field Horsetail

This list includes further chalk grassland plant indicators. These are Marjoram, Wild Thyme, Lady's Bedstraw, Kidney Vetch, Common Spotted Orchid, Pyramidal Orchid, and Bee Orchid. This makes a total of 13 indicator species so far. This shows that the management of the grasslands is creating conditions for characteristic chalk grassland plant species to return.

On 6<sup>th</sup> July a total of about 350 spikes of Pyramidal Orchid were counted in an area of some 600 square metres in the grassland between the long copse and the canal. This was a very spectacular sight and along with the continuing presence of other chalk grassland indicator species demonstrates the management of the grassland in the northern section of the site is working well.

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