

this was done in 2 monthly (i.e - 60 day periods), for the overall period Mar 1995 to 1997 i.e. x 2 monthly samples. However, the overlap periods of the plots were also investigated - in case correlation happened to occur at one or more of these periods. Cognisant of the fact that the appearance of UAPs transcends our terrestrial calendar, [which is purely a convenient set of markers to use as a time scale in this case]; data was investigated for possible relationships which might be significant:

- Direct correlation of UAP events within either high, level or low SSN, or FLUX periods.
- Apparent trend correlation of UAP events with the longer solar cycle trends. (To carry out this fully would ideally require at least 22 years of results; as the solar cycle lasts 11 years!)
- The possibility of a delayed correlation if the UAP event curve is shifted to the right (to test for UAP increased frequency of reports after the high (or low) solar activity).
- The probability that UAP events occur due to an amplitude change but not necessarily consistent with solar peaks or troughs.
- The probability of a correlation when the SSN/FLUX reaches a minimum level or, conversely falls below a certain level; or remains level (i.e. constantly high or low) over a correlated period of reported UAP activity. It is reiterated that this can only be a loosely based analysis because of the possibility that many more events have occurred, possibly in geographical clusters and possibly on certain days - but these have not been seen; or have been seen but not reported.

52. **Results** No direct solar correlation was established. Much more work would be necessary to establish whether combinational effects are responsible - for example combinations of certain weather conditions. However, the tentative link with meteors (see below) seems more tangible.

53. **Correlation Studies - Meteors** While it has become clear during investigations that a large number of variables are involved in the consistency of UAP reporting, and it is acknowledged that there are likely to be more meteors mis-reported as UAPs when, for example, the sky is clear, the weather is fine and warm (inducing more people out of doors in the dark), and when there is a higher forecast meteor activity; further analysis of the reports and correlation with UAP dates, has revealed some interesting facts which may have a direct bearing on at least one possible cause of the unexplained object phenomenon.

54. Meteor activity is continuous in the earth's atmosphere. Every year it is estimated that some 40 tons of matter hits the earth's surface, but this is only a small

proportion of that which enters the atmosphere and, in theory is said to burn-up. If it is postulated that a proportion of the material neither impacts the surface or burns completely it is necessary to conjecture what form this might take, whether it exists at all and how long it might persist if it exists in another form etc. It is not clear why there is a dearth of information in the scientific press on this possibility. It seems unreasonable to assume that all meteors will either burn up completely or reach the surface, without the possibility of some intermediate state. It also seems reasonable to assume that any material which, having sped through the atmosphere at enormous velocity and attained a very high ionisation temperature, must exist in gaseous form before dispersing. It is postulated that it may, instead of (or as well as) forming a gaseous plasma viewed as a visible luminous stream, form (due to variations in atmospheric density and other factors) a single or several plasma bodies. A plasma is a charged body of gas. Rather like ball, or bead lightning, which is formed during a lightning strike it seems possible that multiple rather than single gaseous entities may be formed which might be seen as visible shapes. Meteoroid definitions are at Figure 3-17.

55. It is postulated that a plasma formed from the vaporisation of a solid meteor of sufficient size will comprise millions of particles. These particles will have collected an electrical charge due to a combination of friction and currents which could be expected to flow as the stream passes through both the earth's natural electrical field and any other enhanced fields that may be present at the time due to electrical storm activity. Many meteors are of no consequence being microscopic in size. They would not produce a plasma with sufficient energy. However, some of the meteors which have reached the surface as meteorites are known to contain magnetic and other elements. On entering the atmosphere they may already have properties (e.g. electrical or magnetic currents) of unknown magnitude, of which we are unaware and which may influence their final form as they come towards earth.

56. **Similarity to UAP.** While lunar activity generates ambient light and this determines, even on a clear night, whether the meteors can be seen as they approach, it is assumed that statistically, seen or unseen, meteors will enter the earth's atmosphere at any position around the earth. They will either completely burn up, impact as meteorites or, from the rationale above, it is therefore suggested that under certain conditions the residual material from a meteor could form a buoyant plasma or 'fireball' in the lower atmosphere. During its life, and before natural dispersion, it is likely that such an object would be reported as a UAP. Meteors arrive singly or in multiple showers. These often overlap for significant periods during the year. A plasma formed as described above would appear to have most, if not all the attributes of the objects which are regularly reported as UAP. Therefore, the investigations and findings related to meteors are of special interest.

57. Details of meteor activity are constantly monitored and meteor showers can be predicted using the Meteor Shower Calendar, produced by the International Meteor Organisation (IMO). Meteor shower data was obtained for the years 1995-1998. As

explained in the Working Paper at Volume 2, there are both predictable meteor showers and sporadic meteors. An investigation was therefore made into the incidence of UAP reports and the arrival of one or more coincident meteor showers. According to the IMO there are 38 named meteor showers which were forecast to arrive in the year 1996. Since this was a high incidence year for UAP reports it was appropriate to make statistical studies for this year.

58. Meteor showers arrive singly or in multiple showers. These often overlap for significant periods during the year. For 1996 up to eight named showers arrived at the same time and lasted for a period of several days, sometimes for up to 30 days. However, it is important to note that the showers build to peaks on specific named days. Each type arrives with differing velocities and different densities (rates per hour). The arrival of meteors in the atmosphere is the cause of meteor **trail reports which are often visible to the unaided eye**. As most members of the public are aware of and recognise them as such, they do not report them as UAP. The object of this part of the study was to ascertain statistically whether there was an increase in UAP reports when meteor activity was high but when meteor trail reports were low. This would suggest that the public reports would most probably be as the result of meteor activity even though the reports did not report meteors. If it could be further shown that a statistical variation of UAP with meteor activity exists, then this would explain many of the hitherto inexplicable UAP events and re-enforce the exceptional correlation which was becoming evident with the attributes of gaseous plasmas.

59. For analysis it was assumed that, statistically, the phenomena was likely to occur when the IMO predictions suggested that:

- Several showers of different types occur at the same time.
- A meteor 'peak day' occurs.

60. Some significant 1996 correlation results are plotted at Figure 3-18. The curves show three sets of data, plotted, for convenience, in increments of five days: the UAP rate over each five day interval, the coincident number of different shower types in the same five day interval and, finally, the hourly meteor arrival rate forecast within each five day period. The maximum five-day rate for UAP reports in 1996 was 30 and the lowest was zero. The maximum number of coincident meteor showers was eight. The maximum arrival rate was 143,000 per hour, boosted particularly by 'Geminids', 'Quadrantids' and 'Perseids', each contributing over 100,000 meteors per hour when they were near. Even the least active shower releases 2000 per hour. It should be noted that although not all meteors will approach UK airspace, when the highest density rate is expected then the probability of an increase in UAP reports is clearly present. The objective is to discover whether this is coincident with a correlated increase in UAP reports

61. From the Figure it is immediately evident from the coincident rise and fall of the curves that there is correlation between the number of meteor showers present and the meteor hourly rate (known as the ZHR). This is expected. The important fact is the correlation between the meteor curves and the UAP report curve. The mathematical correlation taken over the year is over 60% (0.62). **This is a reliable positive correlation which would probably have been much higher if man made sources of UAP reports were filtered out.** As has been proved, many reports will be due to over 20 types of other natural aerial phenomena, plus man made phenomena, ranging from lightning and fireworks to laser displays. Perhaps an even more stringent test is that of comparing the actual dates of peak UAP sightings with the actual dates of the meteor peaks, rather than those grouped into 5 day intervals:

Meteor Peak	UAP Peak	Meteor Velocities (km per sec)
January 4	January 7	28, 41*, 65
February 7	February 8	23, 30, 56*
February 25	February 26	23*, 30, 56
March 14	March 18	23, 30, 56*
March 25	March 30	30*
May 6	May 4	30, 66*
August 18	August 18	25*, 31, 34, 42, 59, 66
November 13	November 13	27, 29*
November 25	November 25	27, 28, 29, 60
December 6	December 6	22, 28, 40*, 42, 58
December 14	December 14	22, 28, 35*, 40, 42, 58, 65

Note : * indicates that this day was a peak for that particular meteor shower type. However, at present, with insufficient evidence, there is no suggestion that one meteor shower type is likely to cause UAP to form, more than any other.

62. Significantly it is noted in conclusion that the correlation is date-exact on several occasions and nearly so on the others. There seems little doubt, therefore, that natural UAP reports are correlated with high incidence of meteor activity and, from this evidence it seemed a strong possibility that meteor activity accounts for some UAP reports.

63. It is noted that the co-incidence of peak meteor dates and UAP reports is statistically very high and cannot be due to chance. The fact that sometimes the UAP peak occurs before the meteor peak is not a problem - it is merely that, as the meteor peak date approaches and the entry rate increases, more UAP are seen on adjacent days, than on the peak day itself. This variation could easily be due to the weather (overcast and low visibility) and that (meteor-generated) UAP did in fact occur where there was no one to see them! - or just that the meteorological conditions present in

the atmosphere on the meteor peak days was not suitable for plasma formation. The other key factor, of course, is that gaseous body plasmas did not fall within the airspace of the UKADR on that day - or even if the opportunity to form a plasma occurred, it's subsequent reporting was not viable. The position at which a plasma is eventually formed, assuming a meteor does not burn-up or impact after diving, must depend on the angle of entering the atmosphere, the velocity and the atmospheric conditions (e.g. temperature layers, dust, electrically charged layers, wind). It is clear that an observer noting the falling trail of a meteor may be hundreds of kilometres from its eventual landfall.

64. The final meteor-related investigation was to examine each of the UAP reports on the peak dates to ascertain that they were not merely reported as meteor trails, but more tangible and representative of the exceptional bodies often reported.

RESULT OF METEOR INVESTIGATION

65. The investigation showed that on only 27 occasions out of 1014 UAP events reported for 1995 and 1996 did UAP have 'trails', 'tails' or were 'comet like' or 'meteor like'. Many of those with tails were reported not as meteors but as other types of event which happened to have tails. It is concluded therefore that the public are well aware of the difference between a familiar meteor trail and an unusual phenomenon. It is not unreasonable to suppose that, disregarding any man-made objects which were misreported during 1996 (and in other years) there is a high probability that the remaining events were largely due to meteor plasmas. Some may have been due to other atmospheric electrical events such as lightning. The peak reporting periods which co-incided with meteor shower peaks were not mistaken reports for falling meteors, but were clearly events which occurred after the plasmas had been formed, were usually at low altitude and exhibited the regularly-seen erratic, bobbing, hovering and climbing motion which would not be mistaken by the public and other credible witnesses. In fact, it is clearly to the public's credit that they rarely report meteors as UAP.

HUMAN FACTORS

66. No attempt has been made to separate so-called credible reports from all others, as in intelligence analysis **all information, however innocuous, is valuable for correlation purposes until decided otherwise by the analyst.** For the sample of events taken from the period 1987 to 1991, 36 reports were from Police Officers, 278 from witnesses in declared professions, many from ex-servicemen and women, only nine were from 'ufologists'. These together with all reports from undeclared observers were treated as corroborating evidence where possible in individual cases and as a body of reports which cannot be ignored or dismissed lightly. In the 1014 1996/97 reports 15% were corroborated and often were seen at the same time by a dozen or more witnesses who must be considered reliable. Very few (for example 1.2% in a sample of over 1000 UAP events) were seen on the surface or close enough to surface objects to cause surface effects to the countryside, property or to humans.

Exceptionally, some railway sleepers were set on fire and sometimes the ground was scorched. Effects on humans were minimal, mainly being limited to fright, 'car following', often for several miles and, occasionally, interference with vehicle electronics. Taking all the currently reports held (~30 years), there is insufficient data to carry out a statistical analysis on human effects.

WITNESS GENDER & AGE.

67. A very small proportion of witness reports involve children, usually aged ~8-15. Sometimes adults have been alerted by children, leading to a multiple witness event. In a sample of 850 reports although 64% were submitted by men (who are more likely to walk outdoors in the evening and night by themselves), many hundreds of reports were correlated and confirmed by multiple witnesses of both genders, located at the same place and time, and often accompanied by the civil police, called to the scene. The viewing and reporting of UAP is therefore not a function of gender or age. However, as pointed out at Volume 2, Working Paper No 25, certain types of person may be more susceptible to the apparent fields which emanate from some UAP. These fields are only effective when the recipient of the energy approaches the source to a short distance and enters what appears to be the source 'near field', using the terms of conventional field theory.

WITNESS LOCATION

68. While using individual circumstances to enable the filtering of the most obvious misreports (reflections through glass, etc.), no consistent occasions have been found which have caused obvious misreporting due to the location of the observers, causing, for example, optical errors. The incidence of these is small. Valid reports are received from witnesses from all walks of life and in diverse locations, and few, if any can be attributed to an aberration caused by the location. For example, a phenomenon initially viewed through a car or building window is usually still present when the window is opened or the observer goes outdoors for a better view. The number of optical aberrations causing misreporting are probably very small for surface-based observers and more likely from aircraft, where curved and sandwich windows, rather than flat glass/perspex is used, the duration and field of view is often limited, and for obvious reasons the windows cannot usually be opened. Few observers are up in the mountains at night so there are few opportunities to obtain a view of a UAP from above, from a stationary position, although, (see Volume 2 Working Paper No 13), other unfamiliar, atmospherically-produced phenomena can occasionally be seen.(U)

STATISTICAL CONCLUSIONS

69. The key conclusions are based only on analysis of the available data. No attempt is made here to apply the popular conclusions which the public reach, following a set of UAP behaviour. The key to the enigma of the hitherto unsolved proportion of UAP reports is undoubtedly the proven link with meteor activity and the UAP reports which coincidentally follow if the conditions pertain:

- It is clearly of no consequence as to whether a human is present or not. There have never been any reports that a human has attracted a UAP, however a vehicle may do so. This is attributed to its possible net field charge.
- UAP can climb as well as fly level or dive, do so more than once and do so rapidly and repeatedly. This is believed to be caused by a change in buoyancy or charge, or in both. Sometimes this phenomenon occurs after more than one UAP have merged together, or, it is believed, new UAP magnetic or electrical charge or temperature conditions have occurred.
- The merging of UAP together is frequently reported - but for this to occur they are always in fairly close formation to start with.
- There are isolated occasions when UAP in motion close together diverge. It is believed that this occurs when the attraction between them becomes weak and one or other is attracted away by a stronger field.
- The charged nature of UAP appears to result in forces which enable motion to take place in a direction against the wind.
- Some UAP have been reported emanating a beam or beams of light. Either these have a finite internal source of energy at optical wavelengths or continuously change or retain some form of energy which is emitted as visible light. The only reasonable alternatives are that the UAP emanation comprises charged particles, which either themselves emit light (luminescent) or they reflect ambient light from their particles, viewed in a similar manner to a sunbeam. If charged particles are involved then the presumed discharge path rapidly starts to affect the life and physical nature and position of the plasma. These conclusions are made because observations of this phenomenon is often described as a 'beam' or 'beams' and is often downwards, after which the body invariably changes its characteristics or motion or even disappears altogether.
- There are a limited number of occasions when an apparently solid object is reported in daylight often as a silhouette. This is believed, when a plasma is involved, to be due to total internal reflection. Descriptive shapes, such as triangles, are usually accompanied by a 'light'. This, from the evidence, appears sometimes as what seems to comprise several separate gaseous plasmas, often brilliant in intensity and colour in a loose aerial formation. The outlying plasmas at each extremity are used by the observer to describe the overall shape. The shape described is dependent on the position of the observer. It is noted that aspect plays an important part in shape description. A formation of plasma balls forming a 'triangle' or a 'diamond' when viewed in plan, takes the form of a 'cigar' when viewed side-on. The presence of bright spots in a plasma formation can easily be described as a row of lit 'portholes'.

- Sound is a very rare event from a UAP, indicating that air is not being thrust, as in a normal propulsion mode. This is generally reported as 'electrical', humming, 'whining' or 'crackling'.
- Smell is similarly a rare event and again is described as 'electrical.'
- Because light is the primary mode of observation the statistics show 64% are seen in darkness and 10% in dusk conditions.
- UAP reports can originate from single or multiple sightings at the same location. Because, **once formed, UAP can travel at all altitudes, sometimes at high speeds for their duration**, the same object or objects can be seen by observers at large geographical separations.
- **UAP life can vary from seconds to, exceptionally, tens of minutes.** If the UAP is a plasma its life is limited and it probably starts to disperse from the moment it finds a discharge path. At this point its life either ends abruptly, or its internal characteristics change (a probable change in charge and buoyancy). These usually cause it to move. It may have sensed a more attractive electrical or magnetic field.
- **It has been shown that more than one UAP event can be present in UK airspace on the same day and at the same time at widely spaced locations. There is no indication that these have initially diverged or subsequently have merged. Those that diverge or merge appear as a group within the same location over a limited volume of airspace, usually a few hundred metres in diameter.**
- **UAP reports are not evenly spread from day to day.** The daily sighting reports vary between zero and up to several tens per day. There is no doubt that 99% of these are genuine reports irrespective of whether they are from trained or untrained members of the public.
- The UAP peak in February was unexpected - as during cold winter nights fewer reports would be expected as fewer observers are outdoors. Clearly, despite fewer observers, more reports are generated, because more UAP are apparently present.
- **UAP events, plotted as date and frequency, have been shown beyond doubt to be statistically-correlated to the dates and densities of meteor activity on the assumption that the proportion of meteors entering the Earth's atmosphere are sensibly distributed across the UKADR .**
- Apart from aircraft passenger reports (very rare), few, if any, public reports could be rejected due to the credibility of location (e.g. distortion and misunderstandings

produced by viewing through glass). After initial contact those indoors usually obtained a direct sight line by going outdoors or opening windows.

- **Repeat UAP sightings at different times and dates through the year which have occurred at the same location cannot be shown to have any relevance to the location.** However, it is suspected that the likelihood of UAP may be enhanced by certain locations where electrically-charged plasmas would be expected to be attracted. For example, towards aircraft and aircraft environments such as airfields and air corridors, electrical pylons, electrical rail-lines, charged dust particles in industry or over towns. There is no evidence to suggest that UAP favour militarily strategic locations.
- While a proportion of the large numbers of reports received in the vicinity of airports, military airfields and air corridors are due to misreports of aircraft, most of **the public who live in these areas are quite capable of discerning the difference between something which is a part of their daily lives and something which has characteristics out of the ordinary.**
- Relatively few reports are received from Wales, Scotland, the IOW, NI, IOM and the Outer Isles and from ships in UK waters and from aircraft crews, compared with land-based observers in England. This fact is attributed to a combination of the many factors which must affect aerial observation, including population distribution, airports and air corridor densities, work patterns in the big cities and terrain.
- Lightning can be present for some two hours after a storm and also present when a storm has taken place elsewhere. **Ball lightning, which is a plasma form, and which has been replicated in the laboratory, accounts for a number of UAP sightings.**
- Statistical investigations, using weather data, have shown that **UAP can occur when there is no thunder present anywhere in the UKADR.** Hence the conclusion can be drawn that some events reported as UAP (after filtering out known mis-reports of aircraft, satellites etc.) must be due to other causes.
- Statistical analysis of UAP colour has shown that, either by day or night, the UAP is reported as having a 'light' or 'lights'. One third of all sightings reported more than one (and as many as eight) white light(s).
- On the majority of occasions a single light was reported as a 'round' object, even when the observer could only see the light and not the actual shape if there was one.
- On about 7% of occasions UAP were perceived as 'solid' objects. [Working papers at Volume 2 describe the physics of how it is believed this can occur].

- **There is no statistical evidence to show that UAP form at any particular time of day.** It is believed that UAP which cannot be explained as man made or by other less well known atmospheric activity are spread more or less randomly in time and date and caused partially by lightning but mainly by meteor activity. It is inevitable that more will be reported when the eye is attracted in dusk or darkness, especially if unusual motion is taking place.
- About 14% were reported as 'spinning', 1.6% as 'pulsating' and 'bobbing' or 'erratic'. Usually reports are made because this is an unfamiliar motion of lights in the sky. It is believed that a body of gases which may have varying internal processes taking place, including effects which vary buoyancy and electrical charge may exhibit such motion.
- **Positive (+0.62) correlation was shown between thunder (lightning present) and the presence of UAP reports.** This was taken as a whole over the country. No attempt was made to link UAP locations with thunder locations from the reporting meteorological stations. However, the opposite (UAP present **without lightning present**), was also confirmed; as is the case that **even with thunder present there were many days when the lightning did not produce UAP reports.**
- **No correlation of UAP reports was found with Solar Flux or Sunspot number.**
- Although 64% of reports were forwarded by men, the statistics showed that UAP could be observed by either gender and by children (who frequently called adult attention to unfamiliar sights).
- Over the period 1987-1996 the number of days per year on which there were **no reports** of UAP has been **significantly decreasing** (from 280 down to 130).

	1987	1988	1989	1990	Mean
ENGLAND [1]	109(87%)	319(89%)	200(89%)	102(83%)	87%
SCOTLAND	6(4%)	23(6%)	11(5%)	12(10%)	6%
WALES	10(8%)	15(4%)	13(6%)	3(7%)	6%

TABLE 3-1 PERCENTAGE OF REPORTS BY NATION

Note: The number of sightings from Northern Ireland, The Isle of Man, the Outer Scottish Isles and The Isle of Wight are negligible and are included in the appropriate mainland totals.

	1987	1988	1989	1990	Mean(%)
DAWN	3	25	18	10	7
DAYLIGHT	18	87	42	12	21
DUSK	22	39	20	4	11
DARKNESS	88	211	192	40	60

TABLE 3-2 EXAMPLE BREAKDOWN OF TIME OF DAY OF REPORTS

Year	Jn	Fb	Mr	Ap	My	Jn	Jl	Au	Sp	Oc	Nv	De	Rounded Total
1987	2	7	6	5	6	1	8	26	16	16	19	19	120(150)
1988	41	48	38	21	24	28	17	28	30	31	28	32	365(397)
1989	17	12	14	7	9	9	26	21	28	32	39	11	225(258)
1990	15	11	7	-	-	-	-	-	10	24	8	15	90
1991	10	9	3	2	4	5	14	7	10	13	5	4	85(117)
1992	7	18	2	-	-	-	-	8	1	11	-	5	147
1993	1	-	1	-	2	4	3	9					(258)
1994*													(250)
1995	40	16	28	10	22	27	21	29	22	36	33	20	284
1996	19	71	38	42	44	24	79	80	53	52	55	35	595
1997	35	28	32										95*

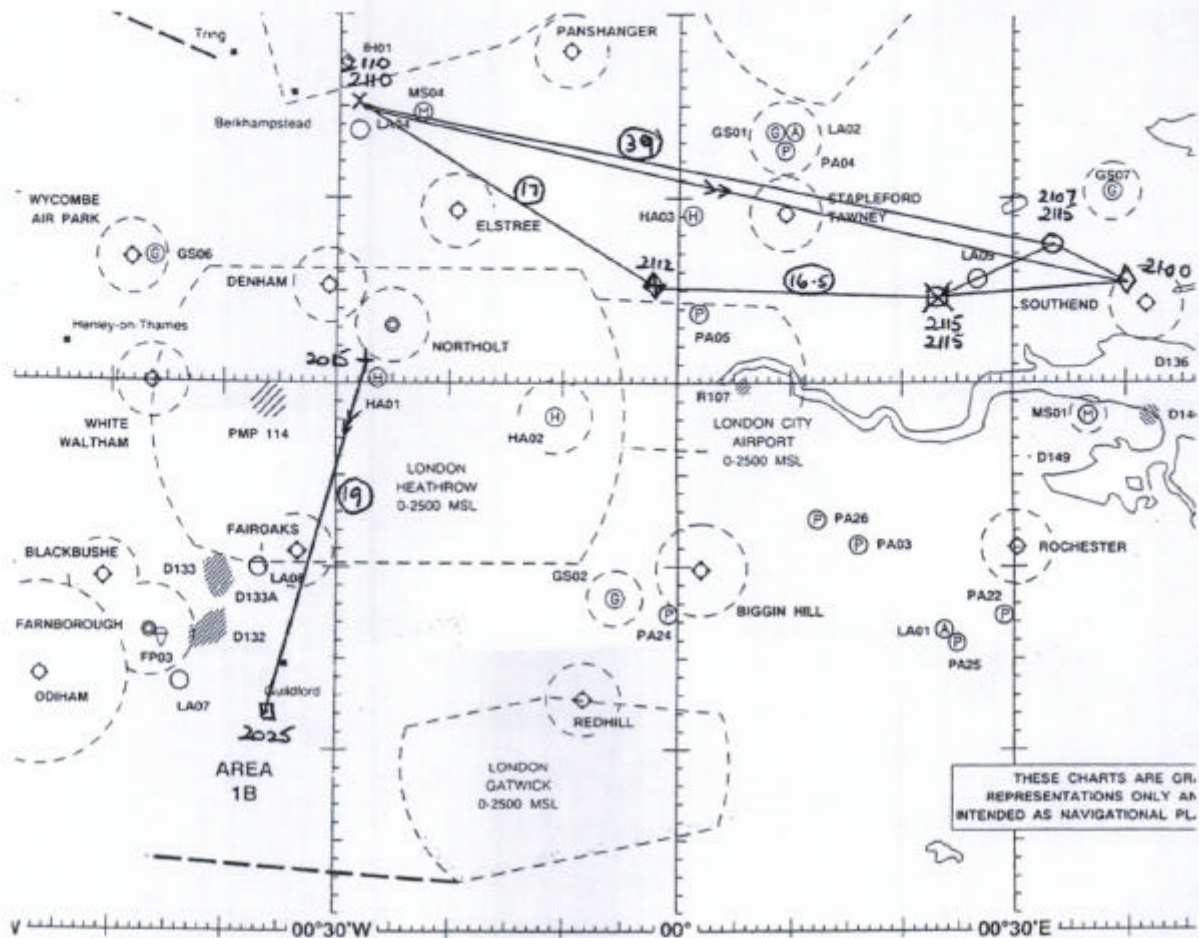
Notes: *Report details incomplete. 1995 figures for first 3 months only.

Bracketed figures show some differences in overall totals due to inaccurate report counts, pre1994.

TABLE 3-3 NUMBERS OF EVENTS PER MONTH OVER 10 YEARS (U)

Year	Jn	Fb	Mr	Ap	My	Jn	Jl	Au	Sp	Oc	Nv	De	Monthly Average	Rounded Totals
1987	29	21	25	26	26	29	24	15	21	20	21	22	21	280
1988	12	8	11	18	17	17	19	15	13	17	15	22	15	180
1989	16	18	21	24	23	23	16	19	11	12	12	23	18	220
1995	13	16	15	24	18	17	20	13	15	14	12	18	15	185
1996	19	8	15	9	9	19	7	6	4	10	10	16	13	130
Mean	18	14	17	20	18	21	17	13	13	14	14	20	16	

**TABLE 3-4 NUMBERS OF DAYS PER YEAR WITH NO SIGHTINGS
REPORTED FOR 5 YEARS BETWEEN 1987-1996 (U)**



Notes: The tracks could represent one or several UAP. After leaving Godalming(S of Guildford) the UAP may have remained unreported an re-emerged in the Southend area and towards Danbury for 7 minutes. A track appears to start N of London at 2110, where it was seen twice (or there may have been two objects) and proceeded roughly SSW towards Danbury. Alternatively, the 2115 hrs Danbury event may have been a second sighting of the 2107 event, as may have been one or both of the Brentwood events. Danbury is on a hill. only on exceptionally clear conditions would it be possible to see an event at Danbury from Brentwood or vice versa. However, an observer at both places would be jointly able to see a target midway between these locations. A time error in the Rochford report would result in the complete (double arrow) track sequence from Hemel Hempstead to Rochford.

FIGURE 3-1 PLOT OF UAP ASSESSED TRACK

(Date: 18 June 1988)

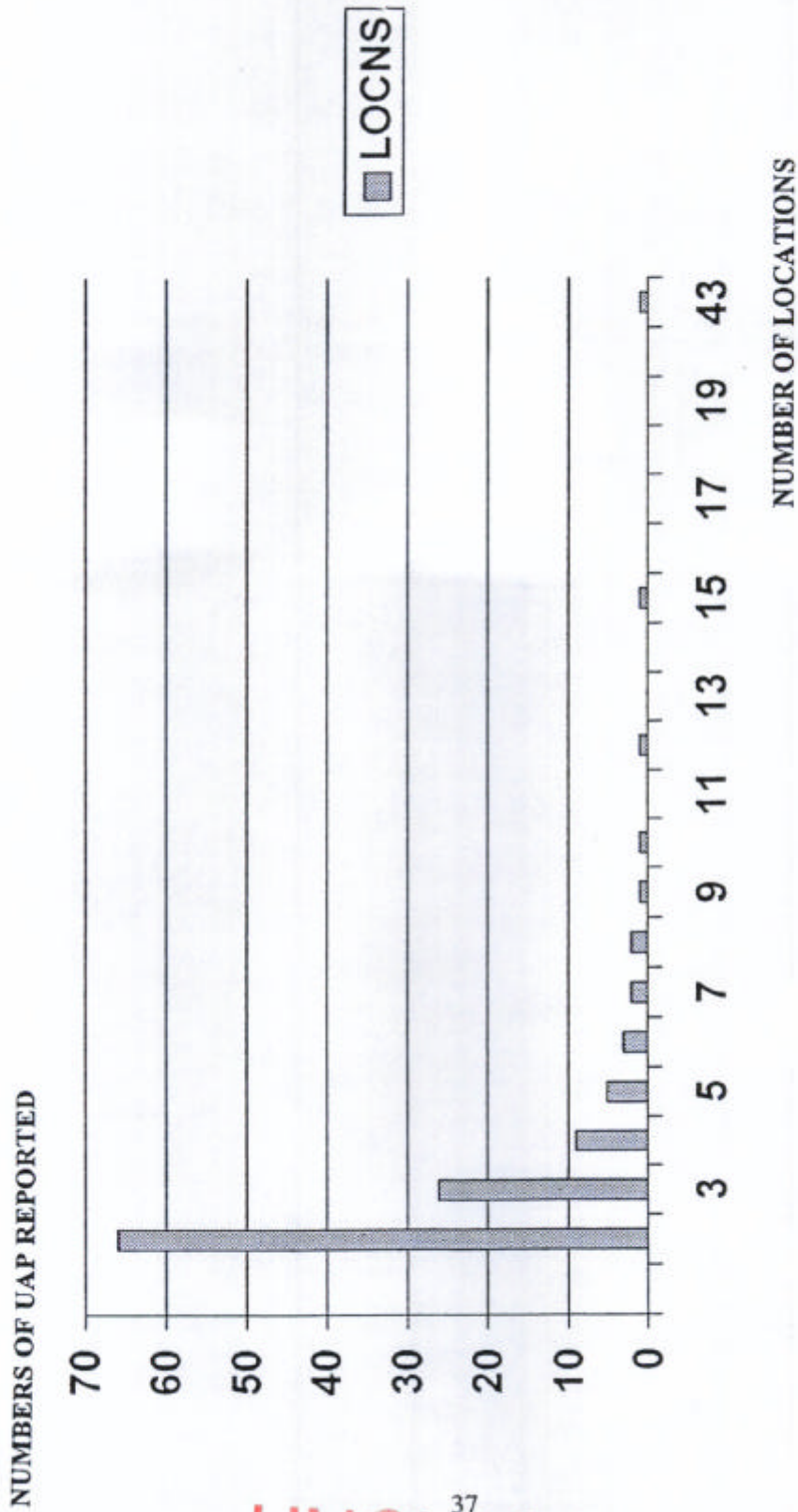


FIGURE 3-3 FREQUENCY OF REPEAT SIGHTINGS AT SAME LOCATION
FOR PERIOD 1987-1991(U)