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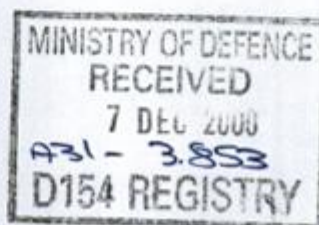
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Unidentified Aerial Phenomena in the UK Air Defence Region: Volume 2

Information on Associated Natural & Man-Made Phenomena

SCIENTIFIC & TECHNICAL MEMORANDUM - No. 55/2/00



December 2000

Defence Intelligence Analysis Staff



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INFORMATION ON ASSOCIATED NATURAL AND MAN-MADE PHENOMENA

VOLUME 2

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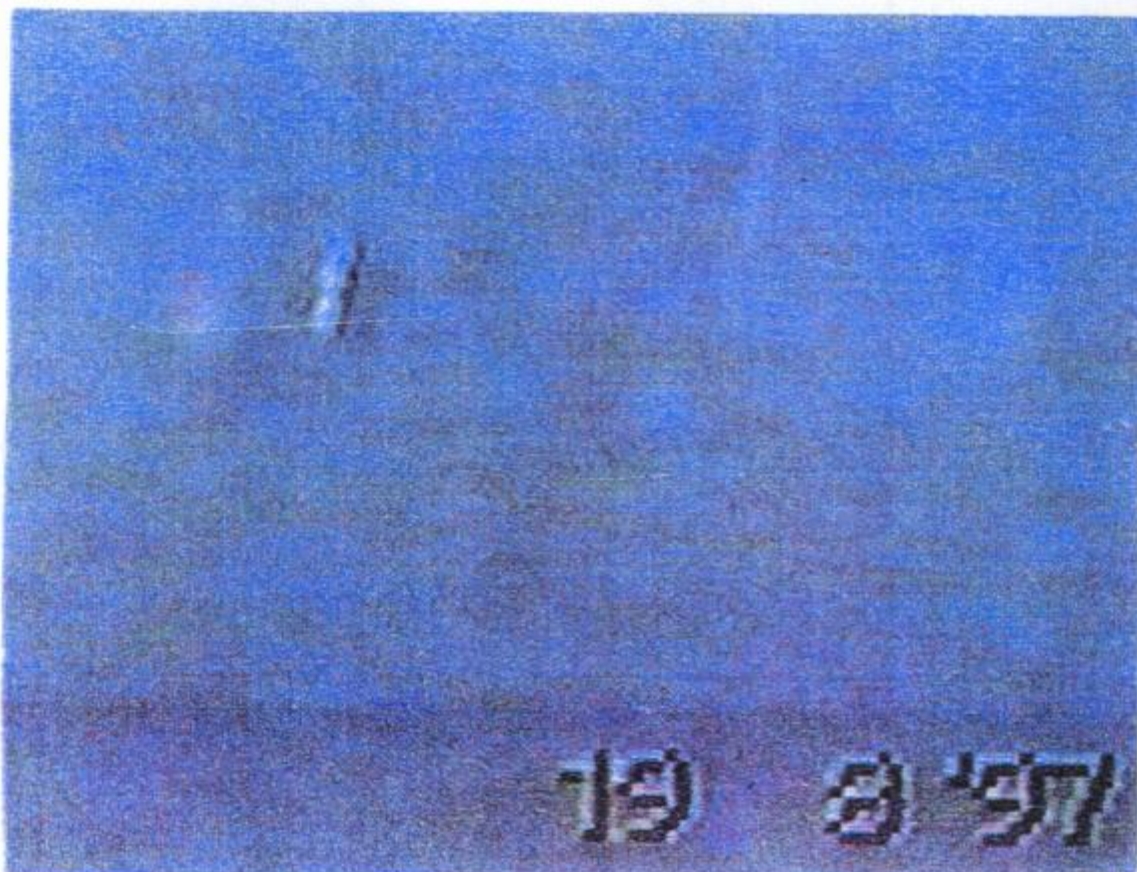
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PREFACE

1. This is Volume 2 of a three-volume 'Report on Unidentified Aerial Phenomena (UAP) in the UK Air Defence Region'. A complete index for all three volumes is at Volume 1. Volume 2 contains working papers, in no particular priority order, resulting from information collected and conclusions drawn from a wide variety of phenomena which have been applied to the study of UAP. (R)
2. This wide spread of background information is required in order to understand the relationship between UAP sightings and their probable explanations. While the majority of UAP reports can easily be explained as aircraft, satellites, clouds etc., it has been necessary to investigate some phenomenal aspects in much more detail. A significant, but rare phenomenon, for example, particularly in the study of alleged UAP effects on humans, potentially causing them to see (and possibly to hear) exceptional events due to UAP field effects and the reported degradation of vehicle electrics and electronics, is that no actual UAP electromagnetic or other field measurements exist. (R)
3. The aim of the attached papers was to act as a reference source during UAP report analysis, interpretation and identification. In many cases much more information is available on most of these topics. That which is included is judged to be sufficient for an understanding in the UAP context. (U)
4. The copyright of reference material used is given wherever this is known. (U)

February 2000

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UAP EFFECTS ON HUMANS, ELECTRICAL/ELECTRONIC EQUIPMENT AND
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UAP EFFECTS ON HUMANS, ELECTRICAL/ELECTRONIC EQUIPMENT AND OBJECTS

SENSING THE PRESENCE OF A UAP

1 The ACCESS Database tables generated for the UAP study encompass all the sensing methods and descriptions, of which humans are capable, except touch. This paper provides an initial overview. Some of the topics are considered in further detail in following working papers. The sensing methods are:

- Aided or unaided visual sight (including colours, shapes etc.)
- Sound (Annex A)
- Heat (Annex E)
- Smell (Annex B)
- Feeling (excluding actual touch), for example sensing air pressure, electrical fields (static effect on skin/hair, burning of skins) - Direct Thermal Effects (Annex D)
- Taste (Annex C)
- Description of the Sighting Location and Environment
- Non-Ionising Electromagnetic Effects. (Annex F)

2. **Animals** Several of the effects are also found to extend, in some parameters, to other animals such as farm and domestic animals.

3. The following sections and subsequent working papers consider each of these effects briefly, as an aid to future analysis of UK sightings. The following review is not in any specific order of priority. Although it is very rare for the initial contact not to be by a visual sighting. The combination of more than one sensing effect, (at para. 1, above) is present on only some occasions.

ELECTRO-MAGNETIC FIELD LEVELS

4. On the assumption that some sort of field emanates from a UAP, though not necessarily on all occasions, and is apparently only influential on humans when at close range; there are three field options, using the most familiar types of field to consider. These are:

- (a) **Magnetic Fields** A magnetic (H) field can be either natural (e.g. Earth's natural field), generated, or stored (permanent). Familiar magnetised ferrous-based materials form permanent magnetics, while solenoids generate fixed or varying magnetic fields. In the UAP context this would either mean the presence of large (and heavy) field generators on a substantial and solid 'craft', or a magnetic field being generated in a UAP comprised of, perhaps, a plasma. As is well-known a magnetic field is polarised, with lines of force (flux) travelling towards the opposite polarity either on the same source or towards the earth's surface. A magnetic flux can be modulated, although the rate and shape of the resulting energy time distribution is affected by the presence of inductance, capacitance and resistance.
- (b) **Electric Fields** Electric (Electrostatic) fields are set up between objects of opposite electrical potential. Familiar manifestations of the presence of an E field is hair standing on end/bristling. For an E field to exist a non-conducting (free space, dielectric/gas) material must be between the charged entities. In the UAP context the E field, (for human effect) would conceptually pass between the UAP 'body' and earth, with the human in between. The human may be 'earthed' (i.e. standing on the surface), depending on the scenario.

- (c) **Electromagnetic (EM) Fields** These are often described generically as Radio Frequency (RF) fields as they are widely used for radio/radar emissions although the EM spectrum extends over a much wider range in practice, including IR, UV and the visible bands. An EM field is taken to comprise both E and H (Electric and Magnetic) components, which are separately detectable and measurable. Close to their origin (normally known as the source or transmitter) their relative amplitudes and phase are usually complex, but after a short distance the resultant wavefront becomes stable. In the UAP context the main interest is in whether a UAP body radiates EM waves, other than those in the visible part of the spectrum - which are present anyway, as the means by which a UAP is most often seen. The polarisation of an EM field is defined by the orientation of its E field to the horizon, but since an EM wavefront might be rotated, then both elliptical and circular emissions can occur.

Currently, the field characteristics of a UAP are unknown but it is a corroborated fact that, in addition to light (and sometimes heat), some

sort of field is emanated which has adverse effects on some people when they are close to the source. A search was therefore made to identify possible effects on people exposed to all three of the main options (a) to (c) above, both physical and mental. The following information is included because of its applicability to the subject, to assist in future analysis and elimination, and especially because of the discoveries at Working Paper No. 25.

Annex D considers EM effects on Equipment and Objects and Annex F non-ionising effects on humans.

MAGNETIC FIELD EFFECTS

5 The findings due to purely magnetic effects are considered to be of prime importance in the UAP content because of the response of the human brain and the similarity to UAP reporting. This has warranted the separate Working Paper No. 25.

A first general effects summary chart for electromagnetic (microwave) effects on humans is at Table F-1.

SOUND

1. Sounds which are sometimes reported accompanying sightings are not unusual in nature (see para 3, below), but the reasons for hearing (or not hearing) an airborne object can be complex. Further, there is wide scope for mis-reporting of those sounds which are heard. (Working Paper No. 8 considers this aspect further). They range from the violent roar or even explosion, to the low hum. The more violent can clearly come from the explosion which sometimes occurs when ball lightning disappears. However, there are reports that objects which seem to emit other sounds (e.g. whistling) or may glow very brightly, can also cause an explosive (i.e. shock-wave effect) as they 'leave the ground' or 'take-off'. These events are apparently sometimes accompanied by the formation of a mist. If an object changes its temperature or surface pressure, condensation can occur if the air is moist.

2. If microwave fields are also involved, the formation of mists may be as the result of water molecule absorption wavelengths forming resonances. (These occur at $\lambda = 0.017\text{m}$ and at four other values when $\lambda < 0.001\text{m}$). However, it is not clear how, or if, this causes the sounds which are reported.

3. The most likely reported sounds, described as normal acoustic waves, are humming, buzzing, whistling, beeping or pulsing; and they are either low or high-pitched. Observers use their own perception of sound and a wide range of descriptions are therefore used.

4. Whistling sounds are reported to be equal or louder in intensity than those of jet aircraft, even to the point of being heard inside an aircraft. Changes in pitch have been noted - not as a familiar Doppler effect, but abruptly, suggesting very high sightline (i.e. observer crossing) rates or abrupt changes of direction.

5. Animals can be 20-30% more

sensitive than humans. Frequent reports suggest extreme animal reaction to unexplained sightings. Human audio upper cut-off frequency is at 20kHz. The cut off, for example, for cats, is 60kHz and the microwave density for sound to be induced in cats is about one quarter of that for humans.

6. It is well established that microwaves can be sensed, i.e. 'heard', as well as normal acoustics. Experiments show that this is likely to occur at RFs between 200 and 3000MHz. ($\lambda = 1.5\text{m}$ to $\lambda = 0.10\text{m}$), with peak power densities of 300m.W.cm^{-2} . Hence PRFs of 50-100Hz can be heard as humming.

7. An entirely different audio mechanism can occur where human biological tissue absorbs energy, which, in turn, increases temperature, causes expansion and pressure - which then propagates as vibration and cause sounds to be heard by the auditory nerve.

8. Sound effects caused by microwaves are dependent on head size (and clearly vary from person to person and animal type). The microwave density levels for humans to receive sound effects is several hundred times the current microwave safety limits. Subjects receiving these extreme levels often describe them as producing very highly pitched whistles.

SUMMARY

9. In summary, there are two mechanisms which can produce sounds which humans have described when in close proximity to unexplained phenomena. For weak intensities and low prfs (or CW) the low audio acoustic range is the normal human reception mechanism. However, when microwaves are present, if the mechanism of tissue vibration is caused, then the noise heard is described as having a much higher pitch. About 6% (of over 300 humans tested experimentally) could hear S(E/F Band) EM emissions as 'buzzing'.

ODOURS

1. Some cases have occurred where peculiar odours have been reported. These seem to be produced by microwaves or high energy electrical fields.
2. These effects are well understood and can be replicated in the laboratory. Normally the smell is described as 'sulphurous', 'electrical burning' or ozone-like.
3. During electrical discharges in the atmosphere many electrical compounds are formed. Nitric oxide, for example, reacts with other atmospheric gases to form nitro-benzene, which smells like bitter almonds.
4. The slow decay of activated nitrogen can exhibit a white glow and may be the reason for white trails (or 'tails') sometimes described by witnesses, whether or not the witness has smelled the chemical reaction.
5. Reports have been received where a 'strange odour' hangs in the air for some time after an event.

TASTE

1. This effect is usually described as the taste one can experience when placing a low voltage (e.g. dry battery) electrode on the tongue. It is often described as 'metallic' and 'tingling'. The effect is created, for example if dissimilar metals are placed on the tongue, creating a battery, with an extremely low (μA) current flow. However, the presence of 'taste' in the vicinity of UAPs occurs without touch.

2. The taste is immediate but the decay

much longer. It is reported that this effect can occur by pulsing and by alternating currents up to $\sim 1000\text{Hz}$. The affect is attributed to the breakdown of the chemicals in saliva. Since the human body is conductive, it is believed that bursts of EM energy could cause the 'taste' effect. Estimates are that a current of $>100\mu\text{A}$ (DC or AC) is required. Less than 1% of a 300+ sample of humans could 'taste' the presence of microwave energy. This may well be modified by the presence/absence of metallic teeth fillings.

EFFECTS ON EQUIPMENT AND OBJECTS

1. The reported effects, which seem to be due to electrical charges, magnetic and microwave energy are known to have caused.

- Overheating of car batteries.
- Metallic objects rising in temperature.
- Magnetisation, which is sometimes retained.

MAGNETIC EFFECTS

2. Objects close to reported UAP sightings have been subject to:

- Permanent magnetism (fences, flag poles). This seems to imply DC or very slowly varying magnetic fields.
- Radio interference. Radios can appear to off-tune (or go off their stations, since, presumably, they move to a non-receiving wavelength). This is possibly due to the magnetisation of the ferrites used as the antenna cores (i.e. part of the tuning loop) in modern communications/radio receivers.
- Interference with magnetic compasses.

3. In the latter case compass rotation rates have been noted. The effect (and speed) can be replicated by exposing the compass to an appropriate pulsed or varying magnetic field.

4. France is known to have measured magnetic field strengths in the vicinity of sightings as early as the 1950s when an extensive field measurement system (network of sensors) was set up for nuclear effects and the earth's geomagnetic field. Measurements to 1 part in 1000 established the change in field (in the presence of a UAP) and extraordinarily-high magnetic fields were sensed. When this level was translated (i.e. scaled) to a reported distance of a few hundred metres between UAPs and radio receivers, from other reports elsewhere, the magnetic flux was consistent with the levels needed to cause the radio receiver effects reported.

5. High frequency magnetic fields, presumably from nearby UAPs, are reported as causing battery acid heating (conducting medium), and other conductors to warm-up, while non-conductors, e.g. rubbers, plastics have reportedly remained cold to the touch.

6. French reports suggest that the slowly varying magnetic fields suspected do not appear to noticeably cause any body-currents in humans. The effects of EM fields on humans is covered at Annex F

7. A report from Finland in 1977, which involved 170 troops on the Finnish border reported RF equipment 'jammed' and no telephones.

DIRECT THERMAL EFFECTS

1. Short-range observations, in almost every reported instance, have been accompanied by a sensation of heat, ranging from mild warmth to severe burning. Normally (but not exclusively) these appear to be line-of-sight effects.

2. If an object is surrounded by a plasma (usually described as 'a glow'), it can radiate broad-band energy well beyond the visible spectrum. If an object is without plasma (i.e. seen to have a 'metal' surface), it can radiate IR radiation from any gases or body heat which may be present, or energy at UV wavelengths.

3. Reports of 'sunburn', severe sunburn, and even eye-pain and loss of vision have been reported. In one event the witness, a policeman, suffered arm-burns through a long-sleeved uniform. But his body was otherwise protected by the car door, behind which he was standing.

4. All indications are that the phenomena at paragraph 3 above could not be IR or UV but must have been microwave penetration at very (ultra) high frequency(s), where even for

humans 'skin effect' (i.e. surface rather than absorption microwave heating) can occur.

5. In the 1950s several reports were received (France and South America) of combined vehicle failure and mild shocks or 'tingling' in proximity to 'hovering' objects.

6. At the time of vehicle failure several reports (Canada) have resulted in apparent temporary paralysis of humans until the nearby object moved away. It is possible that some muscular control (motor-control) nerves can be affected by electrical potential. This can be replicated by medical scientists. One explanation is that either constant or pulsed microwave, coupling into the nervous systems may cause this affect. Pulsed interference with the human system is possible because of the 500 milliseconds muscle relaxation delay.

7. At least one fatal incident is reported, following what was believed to be radiation-induced from one or more energy levels, including the possibility of x-rays, or protons. Effects, ranging from minor skin burns (i.e. sunburn - like) to the level of blisters have also been reported (USA).

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