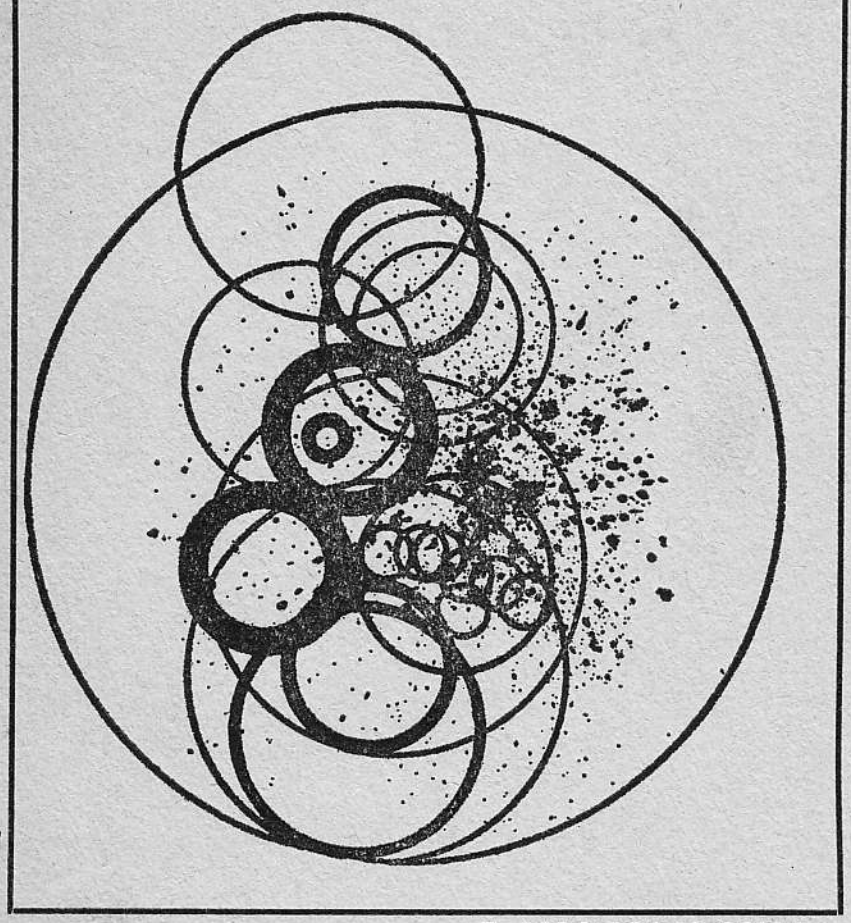
UFO HANDBOOK 2



F. MALCOLM BULL

U. F. O. H A N D B O O K S

N u m b e r 2

Detailing the various natural and man-made phenomena which could be misinterpreted as an unidentified flying object

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by

F. Malcolm Bull

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C o n t e n t s

Foreword

In this Second UFO-HANDBOOK there is given a list of many natural and man-made phenomena which could possibly be misinterpreted as flying saucers, or unidentified flying objects.

It is suggested that the investigator uses the material given here whenever he intends to evaluate a sighting report, since, having read the following pages, he will be aware of the ways in which the various phenomena manifest themselves and he will be better equipped to eliminate the various items one by one by comparing the details below with those mentioned in the report. It is thus possible to arrive at a conclusion as to what the ufo may have been, or, as is equally important, what the ufo was not.

My thanks are due to Mr. J.D. Llewellyn for his invaluable assistance in the preparation of the section on Artificial Earth Satellites; to Dr. G.G. Doel and Dr. J. Cleary-Baker for the help and encouragement which they have given during the embryo stages of the Handbook.

F. Malcolm Bull

The Night Sky

In the original plan for this section of the present volume it was proposed to include diagrams and accompanying description of the night sky as it can be seen at various times of the year. But it was soon realised that this was unnecessary since the interested observer can obtain, for a few shillings, a number of elementary booklets on astronomy which contain star charts of far greater accuracy and detail than could be reproduced here, together with relative details for locating and identifying the celestial bodies.

An excellent book which can be recommended to anyone wishing to acquaint himself with the night sky is:

'STARS AT A GLANCE' published by GEORGE PHILIP & SON Ltd.

With the aid of this or any similar work the stargazer will soon learn to find his way about the sky and amongst the constellations after a few minutes study.

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Aircraft

The information which can be given to enable the observer to recognise conventional aircraft cannot and need not be exhaustive for the following reasons:

1. The charts used in aircraft recognition work would be too complex for the amateur to commit them all to memory.
2. No simple identification system could cover all the eventualities of lighting, attitude etc., of all aircraft.
3. When an object is near enough to be identified as an aeroplane by means of the recognition charts, it will be near enough for the competent observer to differentiate between a ufo and a conventional, and it is this differentiation only which is required in this field of study.

4. If any particular type of aircraft is more likely to be seen than others by an observer, then he will probably be sufficiently familiar with this type to eliminate it from any spurious sightings.

Thus we shall not reproduce here the famous silhouettes of aeroplanes often used for aircraft recognition work, but shall rely on some general points.

Conventional aircraft behave according to the following general principles:

a) they do not normally fly at speeds in excess of twice the speed of sound.

b) they do not effect rapid changes of speed.

c) they do not carry out such manoeuvres as rapid change of direction (such as rightangle turns or instantaneous reversal, sudden halt, and so on.

d) they do not undergo any change in shape, other than that caused by change in attitude relative to the observer.

e) except for those instances mentioned in (o) and (q) below any light from them is reflected from the sun, moon etc.

f) noise, whether of jet engines or motors, usually accompanies them although it may be lost if the object is very high. There may also be a sonic boom if the object's speed is high when it is near the ground.

g) except in emergencies and when landing at airfields, etc., they do not approach the ground.

h) only in rare instances do they fly in groups of three or more.

i) planes in the vicinity of airports, R.A.F. airfields and such are more likely to perform manoeuvres than are those remote from these places, and even so their movements are in accordance with the above notes.

j) except for hovercraft, whose altitude is unlikely to exceed a few feet, all aircraft are of the familiar design, thus a circular object is more likely to be a ufo, and so on. See (s) below.

Aircraft lighting. The following basic system is in use:

k) a single unbroken red light is carried on the port (left) wing.

l) a single unbroken green light is carried on the starboard (right) wing, and like the red light it must be visible at a distance of five nautical miles.

m) a tail light consisting of an unbroken white light must be carried, and this must be visible at a distance of three nautical miles.

n) a central white landing light is often rotated, and to an observer this would appear to be flashing.

The following are circumstances which may lead to an incorrect identification of an ordinary aircraft:

o) when flying through broken cloud, by day or night, the plane may appear unusual, and may lead the observer to conclude that its shape or direction is changing, or that lights are flashing.

p) flying low over large cities at night the underside may reflect a coloured glow from the city lights. See (e) above.

q) when the windows of the plane are illuminated at night it may suggest an incorrect identity to the unwary.

r) any view of an aircraft along the plane through the wings and body, that is, looking along the wings, could suggest a cigar-shaped object.

All the above comments refer only to those aircraft displaying normal proclivities, but should the plane be a specialised one it may not conform to the above. Examples of such deviations are:

s) research aircraft such as those studying the earth's magnetism. These have a bomb-like appendage hanging from the fusilage, following and below the aeroplane itself.

t) searchlight-carrying aircraft which may be seen sending a bright beam down to the ground have been mistaken for

ufo's on more than one occasion.

u) prototype aircraft also represent some element of confusion particularly if they are of revolutionary design. The only types which deserve a mention here are the 'delta-wing' and 'flying wing' designs, the latter looking rather like a boomerang or a pair of wings without a body.

Finally we come to a map of the air corridors and routes over the British Isles. This shows the main air routes over the Islands along which aircraft could be seen, and the direction of the corridor gives an indication of the direction of flight which an aeroplane would follow.

The investigator can use the map to determine whether a certain object is likely to be a plane if he checks whether the observer was in the vicinity of one of the corridors at the time of the sighting.

Explanation of the map of air routes over the British Isles

Place names have been omitted for the sake of clarity.

The nine hatched areas represent control zones covering the major airfields in those districts. In these zones aircraft are flown at heights and in directions as laid down by Air Traffic Control Instructions.

The broken lines represent the major air lanes along which aircraft may be flown, the actual path extending for about six miles either side of the broken line.

The heights at which aircraft may travel along these lanes varies between ground level and approximately 3000 feet at some points.

The map is meant to be no more than a guide to the main areas within which aircraft can reasonably be expected, but it should be useful to enable the investigator assess where aircraft can and cannot be sighted. A knowledge of local flights and times would help considerably in this connection.

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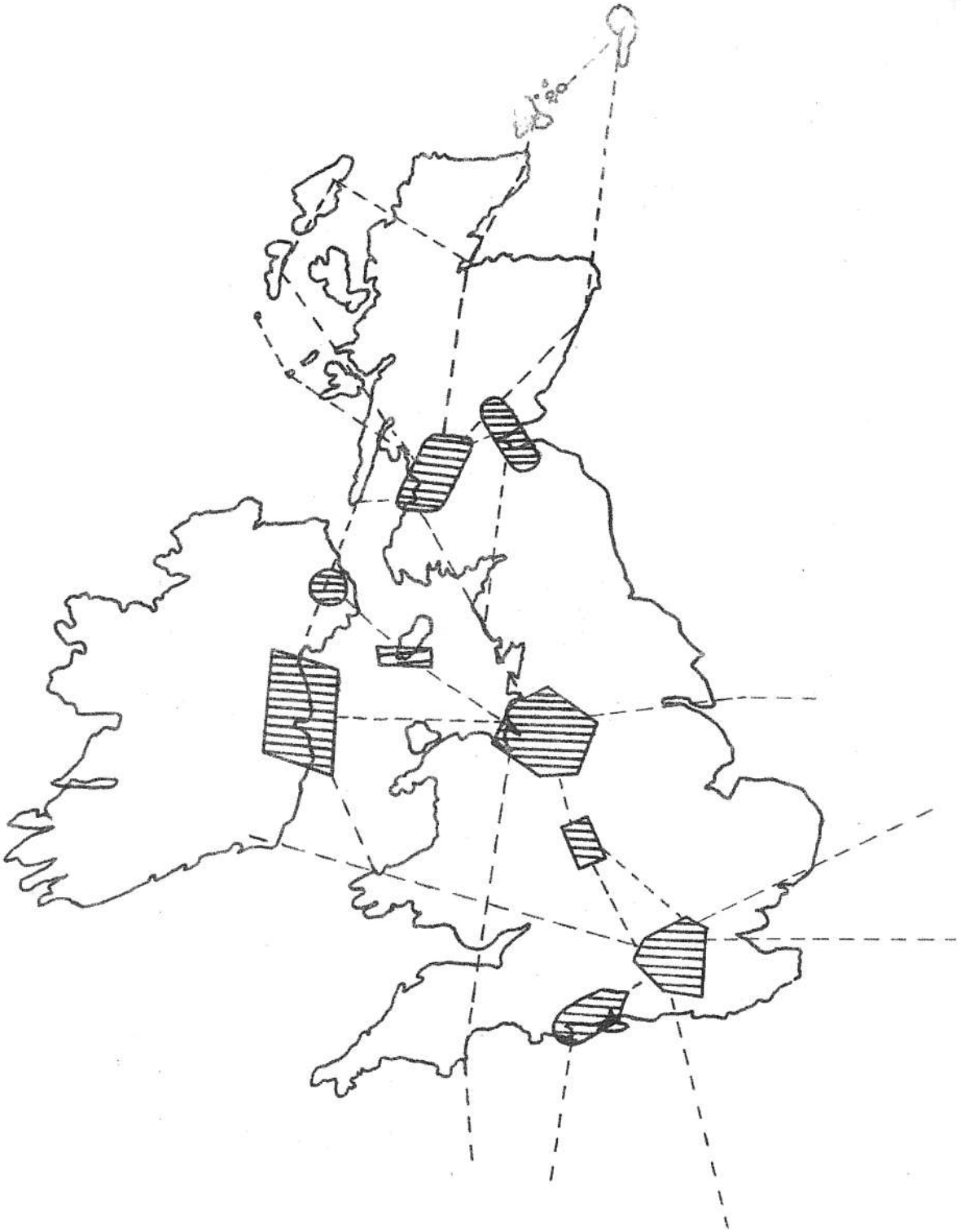

Artificial Earth Satellites

News of the launching of these instruments was once front page news, but with the increase in their number they were gradually relegated to a few lines in the papers, and today they are hardly mentioned at all. Up to the end of December 1964 there were about 160 satellites in orbit. This number is mostly made up of satellites and rockets, and does not include the thousands of bits and pieces associated with each launching, nor does it include the various probes which have been launched to the moon and the planets. Consequently it is most difficult for the amateur to keep any check on the details of all the objects in orbit at any particular moment. Whitaker's Almanack is useful in this respect giving orbital statistics for all satellites launched. Current figures are less easily obtained, although the Department of Scientific and Space Research at Slough can help here.

Contained in the ufo-sighting reports of groups and societies throughout the world are many sightings of satellites, and to help the observer to recognise such devices we itemise

Characteristics of appearance and behaviour of artificial earth satellites

1. They cannot be seen with the naked eye in day time.
2. Only a few are visible to the naked eye, the best known being ECHO 1 and ECHO 2, which had brightnesses comparable to Venus and Jupiter.
3. They are seen as moving star-like objects.
4. The general appearance of a satellite is star-like with no detail whatsoever, although through optical instruments much more detail would be discernible, such as the reflected image of the sun.
5. The fainter objects may appear to be steadily twinkling, appearing very dim or brighter in certain parts of the orbit.
6. If observed through cloud satellites may appear to have a halo.

7. The transit time, that is the time between the rising and setting of a satellite, may be anything up to half an hour.

8. All orbitting objects rise in a curve to their highest point in the path across the sky (apex) then fall away towards the horizon. Non-orbitting objects have straight line flight paths.

9. They may be seen to disappear or appear during their motion, this is due to their entry into, or exit from, the earth's shadow - known as eclipse.

10. With the introduction of launching satellites into a retrogade orbit it is not unusual to see them in any part of the sky, travelling in any direction.

The factors which would lead one to suspect that a certain object might reasonably be classed as a ufo are whether it displays any extreme deviations from the above characteristics, such as showing a definite colour, change in speed during transit, change in direction, manoeuvres, more than one object seen moving together - any or all of these suggest an unidentified flying object.

Unidentified satellites

Of the total satellite observations reported there is a steady percentage not attributable to known satellites, of these about one-third is later identified as satellites having deviated from their predicted positions. But what of the remaining two-thirds?

In 1953 the American astronomer Clyde Tombaugh detected two mystery satellites. In February 1960 many British newspapers reported that the U.S. Defense Department had announced the detection of an unknown object weighing 15 tons moving in a polar object.

It is suggested that the interested observer and investigator familiarise himself with an artificial earth satellite and its behaviour, transit details are given in several daily papers, in order to enable him to distinguish an AES from a UFO.

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The Earth's Atmosphere

Surrounding the earth there is a comparatively shallow layer of gas which we call the air, and upon which most life on the planet depends. It is a mixture of 78 per cent nitrogen and 21 per cent oxygen, the balance being made up of argon, carbon dioxide, and traces of hydrogen, neon, krypton, ozone, zenon, together with water vapour and particles of dust and smoke.

It is divided up into a number of layers each with its own characteristics, as described below.

Troposphere:

this is the region of winds and clouds within which all our weather is found. It extends from the earth's surface up to about seven miles, the temperature falling by ten degrees Centigrade for every mile we ascend. It is estimated that 80 per cent of the total weight of the air lies in this layer.

Tropopause:

this is simply the boundary between the troposphere and the stratosphere.

Stratosphere:

in this region the air is too thin to support life, and the absence of water vapour prevents the formation of cloud here. The upper boundary of the ozone layer lies within this belt. The temperature does not fall as we ascend.

Stratopause:

at a height of 35 miles this region divides the stratosphere from the mesosphere.

Mesosphere:

this region extends upwards to about 60 miles, and it is here that the D-layer is found.

Mesopause:

this is the boundary between the mesosphere and the region of the atmosphere in which such phenomena as aurora and meteors are detected. It lies about 65 miles up.

Ionosphere:

it is in this region of ionised atoms that the key to long-distance radio communication lies, for here are found the various layers from which radio waves are reflected.

Heaviside layer:

also called the E-layer, this is a belt of ionised particles at a height of 70 miles, and it is found to reflect radio waves in the frequency range 3 - 3.8 Mc/s.

Appleton layer:

also known as the F-layer, it is divided in the daytime into two distinct belts, the F_1 and F_2, whose characteristics are given below.

F_1 layer:

lying 125 miles above the earth's surface, this reflects radio waves in the range 4-5 Mc/s.

F_2 layer:

this layer is found between 200 and 250 miles up, and reflects radio waves in the 6-12 Mc/s range. During the night this layer descends into approximate coincidence with the F_1 layer.

The frequencies given above only approximate, varying somewhat according to the time of day. If a frequency is greater than the critical value given it will penetrate the ionosphere and escape into space. The layers are also affected by solar activity, and it is for this reason that radio communication is often disrupted during times of sunspots.

Exosphere:

above and beyond the ionosphere lies this the outermost layer of the atmosphere. In this region the air is not a continuous gaseous body, but a mass of particles moving into separate orbits. Above the exosphere lies the relative vacuity of outer space.

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Aurora Borealis

To the informed observer the possibility of confusion arising between an auroral display and an unidentified flying object might seem remote, but since all observers are not as informed as they might be, it is perhaps wise to describe the ways in which this phenomenon is manifest.

The various stages of a display are distinct in form, although the transition between them is often difficult to discern. The most well-defined auroral forms are:

Glow

a general golden or yellowish brightening of the northern sky, possibly extending upwards for about 15^{o} and covering more than a quarter of the horizon.

Homogeneous Arc:

a band of light, flattened at the base, approximately 25^{o} above the horizon, tapering at the ends where it touches the horizon. This may last for an hour or more.

Rays:

one or more bright shafts of light looking rather like searchlight beams in the night sky. This may often be seen together with a homogeneous arc, when the formation is called a rayed arc.

Draperies:

this is a most beautiful formation resembling delicate

curtains waving in the breeze. Swaying and twisting in the sky they are coloured red, green or white.

Corona:

This is a spectacular variant of the draperies described above. It is produced when the draperies rise so high in the sky that they form a circular wreath radiating from a central point. It may be dramatically enhanced by flame-like extensions from the horizon reaching towards the centre of the corona, whilst the sky itself may be coloured red or green.

Flaming Aurora:

Usually the finale of a display, these are sheets and rays of pale light which flash up from the horizon towards the centre of the display.

After the major activity has subsided the initial glow may still remain, and the whole display may break out again.

The cause of the aurora is particles thrown out by active areas on the sun's surface. As these corpuscles approach the earth they are deflected towards the magnetic poles where they enter the atmosphere, bombarding ionised atoms and molecules, causing them to emit visible light.

Because of this close association with the poles the frequency of displays is at a maximum around the Arctic Circle, decreasing until they are hardly, if ever, visible south of latitude 35°. In the Orkney and Shetland Isles displays can be seen on approximately 100 nights per year, whilst in southern England the number is only about six nights per year.

The phenomenon is most likely to be seen in the northern sky, although the flaming aurora may cover the whole heavens.

The brightness of a display is very impressive, but it is still not bright enough to be visible in daylight, and even street lights dim its radiancy.

It is calculated that all auroral activity lies about 70 miles up, and may extend up to five or six times this height.

Consequently, it is improbable that if any noise were produced by the activity it would be heard at ground level; nevertheless, many observers have reported that a display had been accompanied by a faint hissing or sighing noise. This may be the result of an associated electrical disturbance nearer the ground.

The connection with the sun's activity leads us to expect that the eleven-year sunspot cycle would be reflected in a similar aurora cycle, and with some minor deviations this is reasonably true. The last sunspot maximum was 1957-58.

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Balloons

These can be divided into two subsections

Balloons for amusement:

including children's coloured toy balloons, accidentally released, and the mass launchings of hydrogen filled balloons sent up in the well-known 'whose-balloon-can-go-the-furthest?' competitions held at fetes and galas. It could perhaps be mentioned that members of this latter group seldom stay closely together over long distances.

Balloons for research:

presenting a more serious problem, in so much as they are more sophisticated devices with complex pieces of apparatus suspended from them, and it is this equipment, often including metallic sheets to facilitate radar detection, which produces the reflections occasionally seen and described in sighting reports.

As the balloon ascends the gas inside will expand, thus inflating it, and because of this they are not fully inflated on launching, otherwise they would burst. This may give the balloon the appearance of being rather loose, the fabric often hanging down in drapes below the main body.

Since they are commonly used to study winds in the earth's upper atmosphere they may be brightly coloured to permit visual tracking, and this also brings them into contact with our branch of study.

Incidentally, if one of these balloons is found there is often a fee payable on returning it to the appropriate authority.

Visually they are as just described, the major additional points arising when they are stationary, or very slow-moving - apparently hovering - or when reflecting sunlight from the fabric of the balloon itself, and all the possibilities should be borne in mind.

The movement of all balloons is governed by the wind, and thus they are unlikely to execute manoeuvres when very high up, rather, do they drift smoothly, possibly appearing motionless, as mentioned above. As has been mentioned elsewhere the wind at ground level is not necessarily the same as that at a higher level, and this must be remembered when wind-borne objects are being considered.

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Birds

Although everyone is familiar with the appearance of these creatures there is a small percentage of ufo reports which could be attributed to them. Most misleading cases arise when the birds are seen under unusual conditions of lighting, particularly at night.

The spectacle of a bird flying across the face of the moon at night can be both unusual and unnerving, and these two factors combined can give rise to a sighting report, and even more so if the observer is inexperienced.

When flying in formation geese can look beautiful, but when very high in the sky the V-formation can be very deceiving.

Possibly the strangest sight which a bird can produce is that of the luminous owls. This is due to the bird being covered with pieces of rotting vegetation; as the vegetation decays it produces phosphorescent material which glows more noticeably at night. If the observer sees this at night it is bound to bring forth a sighting report of an unidentified flying object - that is, if the observer is in any fit mental state to report the event!

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Clouds

In the British climate there is little necessity to go into much detail in describing the cloud formations, the most common types being:

Cirrostratus:

thin high cloud usually in the form of thin sheets. Found at heights of 30,000 feet.

Cirrocumulus:

'mackerel' sky, this is familiar as a series of round, fleecy clouds joined in lines. Found at heights of 25,000 feet.

Cirrus:

these thin wisps of cloud are well-known, looking like strands of wool, or a horse's tail, in the sky. Found at heights of between 20,000 and 30,000 feet.

Cumulonimbus:

'thunderclouds' consisting of an extremely dense mass of vapour, they can be several thousand feet in depth.

Altostratus:

a continuous layer of thin cloud found at heights of 15,000 feet.

Altocumulus:

lines of cloudlets, which may or may not be joined together. Found at heights of 10,000 feet.

Nimbostratus:

the familiar dark grey rainclouds, they are found low in the skies.

Cumulus:

Probably the best known cloud type, they resemble white mountains floating across the skies on an almost horizontal base. Often seen on summer days they are found at heights of 5000 feet.

Stratocumulus:

cloud layer consisting of lines of cumulus-like clouds at heights of around 10,000 feet.

Stratus:

a horizontal sheet of thin cloud found at heights of about 2500 feet.

Although these are the 'basic' cloud shapes and formations their number is increased vastly by variations on the basic appearance, such as the famous anvil clouds when the interior of a cumulus cloud rises up and flattens out to resemble a blacksmith's anvil.

There is a small number of clouds deserving special mention since their unfamiliar appearance may lead to misinterpretation.

Lenticular:

this type is probably the form most guilty of misleading observers, and its appearance has often been described as 'like a flying saucer!'

They are almost always symmetrical in shape and circular in appearance, and it would be usually possible to reproduce the appearance by means of a heap of coins, of various values, placed one on top of the others in any order. It may look like a pile of plates, or startlingly like an Adamski saucer.

The lenticular cloud can occur alone, or in the

company of dozens of similar clouds; it can appear in an otherwise clear sky, or it can turn up amongst the regular cloud types already discussed. It is in this last instance that it is most open to incorrect identification, looking like an artificial craft flying amongst the clouds.

We need not mention their origin except to say that they often form over mountain peaks where the ascending air sculpts them into the delicate and very beautiful shape with which they drift across the sky.

Noctilucent:

these are quite normal cloud formations, except that they are so high in the sky that they still catch the rays of the sun when the rest of the sky is dark. This gives them appearance of being luminous against the black night sky, and it is this property which makes them the prey of the flying saucer spotter.

Opalescent:

also called 'mother of pearl' clouds, these are ordinary types which, through freaks of light refraction, are tinged with the colours of the spectrum, this being most noticeable at their edges. Since it looks just like an ordinary cloud it is unlikely to be mistaken for a ufo, but one never knows.

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Comets

Except for the really bright comets such as Halley's or the Arend-Roland comet of 1957, which are widely publicised in the press, it is unlikely that there will be any confusion between these and ufo's.

The general appearance of naked eye comets is that of a misty patch of light which may, or may not, develop into a bright central spot with a tail of faint light directed away from the sun.

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Gegenschein

This phenomenon, also known by the English name of counterglow, may often be seen in this country shortly before sunrise, in the west, or shortly after sunset, in the east.

It is visible as an oval glow measuring roughly 10° long and 6° wide, and always lies exactly opposite to the position of the sun in the sky.

The origin of this misty patch of light lies in sunlight refracted by the earth's atmosphere which acts as a lens, focussing the light on to the dust and interplanetary particles outside the earth.

It is extremely elusive and very short lived, and it is improbable that any but the most ill-informed sky-watcher could mistake this for a real object.

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Fog, mist and rain

The main effects which these three can have on visual stimuli is to distort or obscure. A light viewed through a mist will appear to be surrounded by a saintly halo, and if the mist thickens to become a fog, or even smog, the colour of the light will be yellowed and dimmed until the light is finally invisible.

A second and less familiar aspect of fog and mist is when they act as a screen upon which shadows can be thrown. The Brocken Spectre in Saxony is the most well-known of this type of apparition, and is produced when the sun, being low in the sky, throws an image onto a mist or cloud bank. Refraction may cause the image to be surrounded by a halo of spectral colours.

Since rainfall represents a cloud of individual particles its action is in some way similar to that of mist. The familiar rainbow being the best illustration of this, and nothing need be added to what the observer knows about this, except perhaps to remind him that red is on the outside and violet on the inside of the bow.

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Green Flash

This is a most controversial and unpredictable apparition seen when the sun is very low in the sky. It is seen as a momentary green flash as the last segment of the sun's disc disappears below the horizon, or as it rises above the horizon.

Two causes have been put forward to account for its origin. One says that it is a result of colour fatigue in the human eye, in so far as the observer's eye becomes fatigued by the red content of the sun's rays when it is low in the sky, this causes him to see a complementary green flare immediately the source of the red light disappears. The second theory attributes the flash to atmospheric refraction of the almost horizontal light rays.

It is said that the green flash is more likely to occur if a small cloud lies directly above the sun when the edge of the disc is visible over the horizon. In this case the green flash will appear to fill the gap between the cloud and the horizon.

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Leaves, kites and others

Like the balloons dealt with separately, these objects are dependent upon the wind for their movements, the main danger lying in the fact that they may be wrongly identified when under unusual conditions of lighting.

It would be very difficult to give rules to identify them under all conditions, and it is better that the investigator and observer should use their own experience of things here.

Since they are carried by the wind it will be useful to have details of the meteorological conditions at the time of the sighting, but it must be borne in mind that the winds in the regions where the kites etc., are moving do not necessarily blow in the same direction as those at ground level.

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Haloes and Coronae

These are rings of light seen to surround the sun or moon, and are produced by the refraction of light by ice particles in cirrus and cirro-stratus clouds in the upper atmosphere.

The appearance is of a pearly ring centred on the luminary, having a radius of 22^{o}, although there may be a second and concentric ring of 46^{o} radius. The colour is most often white, but they may exhibit the colours of the spectrum with red on the inside.

They are stationary relative to the luminary upon which they are centred.

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Luminous Sky

A less well known phenomenon this is a faint glow covering the whole sky, causing the fainter stars to be invisible, and it may take the forms of brighter lines and bars a few degrees in width. The bars need not be very distinct, and the general brightness is less than that of the Milky Way. The formation, which may be accompanied by more compact forms, is motionless and very pale white in colour.

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Meteors and Meteorites

Lying between the orbits of the planets Mars and Jupiter there is a belt of many millions of pieces of rock ranging in size from lumps over 200 miles across down to microscopic particles. These bodies, called asteroids, behave exactly like the major planets as they orbit the sun, but since they are so small compared to the other planets they are easily deflected by gravitational fields, by that of Jupiter in particular, and their orbits have become very eccentric, some passing very close to the sun, others moving right out to the edge of the solar system before closing in on the sun again, others even leaving the solar system completely.

In their various wanderings around the sun these minor planets often pass near the earth, and a large number actually enters our atmosphere. They are invisible to the naked eye until the upper layers of the air causes them to glow due to heat generated by friction as they rush through the atmosphere, rendering them visible.

It is estimated that over 8,000 million meteors enter the earth's atmosphere each day, but only a minute fraction of these is large enough to cause a glow noticeable to the ordinary observer, and of this small number a tiny percentage reach the earth's surface before they have burned away completely. When these objects land they are called meteorites.

They are visible at any time of the year, day or night, from any place on the earth, but they are more easily seen when the sky is dark. There are certain nights of the year when their activity is more marked than others, and a list of these dates is given in UFO-HANDBOOKS No. 1. During any one night more meteors are visible in the early morning.

The general appearance of a meteor is a sudden flash of light against the dark sky, there motion being always fairly quick. Their actual speed lies between seven and 45 miles per second for evening and early morning meteors respectively, and their flight paths are straight lines in any direction away from the radiant, lasting for one second or less.

They first become visible at heights of around 65 miles, and disappear at about 45 miles although there are considerable divergences from these values.

The colour of a meteor can be white, through yellow to bluish, and their magnitude varies from invisible to the brightness of full moon. The most peculiar and remarkable types of meteor and meteorite are described below.

Fireballs:

these are bodies as brilliant as full moon, and on passing they may leave a trail lasting for several minutes. A popular description of these objects attributes them with a distinct green colouration, leaving a cloud-like trail after they have burned away.

Bolides:

these meteoric bodies have been reported throughout history, being remarkable in that they end their flight by exploding violently and loudly, throwing fragments down to the ground.

Meteorites:

as has been said above, the majority of meteorites burn up before reaching the earth's surface, but a small number does land on the ground. Such objects, called meteorites, can be seen in almost any museum. The largest known meteorite is at Grootfontein, South Africa, and measures 9 feet by ten feet; made of iron it weighs over 50 tons.

Tektites:

probably the strangest of all meteoritic objects are the tektites. These are small glassy bodies found in certain well-defined areas of the earth. Their shape ranges from quite irregular to beautifully symmetrical weighing from a few milligrams to up to a pound. The colour may be black or dark green.

Analysis shows that tektites are composed mainly of iron, aluminium, magnesium, calcium and silicon oxides, and it is found that they have been submitted to two separate heating processes during their history, one slow and one intense. This has given rise to the theory that they were produced in lunar volcanic eruptions and thrown down to earth the outer layers heating due to friction as they fall.

Tektites found in Australia are called australites, in Czechoslovakia, moldavites, those found in Texas, bediasites. It will be noticed that there are no areas of the British Isles where they can be found.

Broadly speaking, there are two sorts of meteors, the sporadic and the shower types. As the name suggests, the sporadic meteor enters the earth's atmosphere alone, and it is this type which is usually very large and often very spectacular. The shower meteors are mostly large groups of tiny particles

in a common orbit around the sun, they enter the atmosphere together and burn up as a shower of impressive sparks. All the dates listed on page 24 of UFO-HANDBOOKS No. 1 are of shower meteors, although the members of the swarm may enter the atmosphere and burn up separately.

Sporadic meteors are generally half stone and half iron in composition, the so called stony-irons; shower meteors are usually 100 per cent stone. Approximately 93 per cent of all meteorites are stones, 2 per cent are stony-irons, and the remaining 5 per cent are wholly iron in content.

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Mirages

These are optical illusions caused by refraction of light rays by layers of hotter, and less dense, air near a heated surface. The effect is to make a distant object appear nearer, and also to cause the top section of an object to be reflected as if in a mirror.

As the heated air ascends it causes the image of nearby objects to shimmer, and mountain peaks, reflected to look like two soup-plates joined mouth-to-mouth, waver mysteriously, as though hovering.

Their very nature renders them more likely to be seen on warm summer days.

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Planets

The name 'planet' is derived from the Greek word for a wanderer, because, unlike the stars, these tiny points of light appear to wander about the sky from night to night. To the casual observer their appearance is indistinguishable from that of a bright star.

The planets are visible throughout the year, and the exact dates when they reach opposition (the date when they

are on the meridian at midnight) can be found in an almanack. A short list of the zodiacal constellations in which each of the naked eye planets can be found for the years 1964 - 2000 is given below.

Mercury and Venus can only be seen near to the sun in the sky, at maximum distances of 27° and 47° from the sun respectively, and they are best seen before sunrise or after sunset, otherwise their visibility is curtailed by the very great brightness of the sun, as is the case with most other celestial bodies. All the planets move along the ecliptic, the band of sky along which the sun travels in its yearly movement amongst the stars.

Only the five major planets - Mercury, Venus, Mars, Jupiter and Saturn - are visible to the naked eye observer, and, as stated above, they look just like a star except that they are generally much brighter and do not twinkle except when very near to the horizon.

Mars has a reddish appearance, Mercury may look pinkish, but the other planets are white in appearance.

The stellar magnitude of the planets (at their brightest) are:

Mercury	-0.2
Venus	-4.08
Mars	-1.94
Jupiter	-2.4
Saturn	-0.8

Positions of the planets Mars, Jupiter and Saturn amongst the Zodiac

As explained above, the planets Mercury and Venus always lie near to the sun in the sky, and the planets Uranus, Neptune and Pluto are not visible to the naked eye. The following table shows in which of the zodiacal constellations the remaining three planets can be found for each year until the year 2000. It is suggested that the investigator familiarises

himself with the night sky.

Year	Mars	Jupiter	Saturn
1964		Aquarius	Aquarius
1965	Virgo	Aries	Aquarius
1966		Taurus	Aquarius
1967	Libra	Gemini	Pisces
1968		Cancer	Pisces
1969	Sagittarius	Virgo	Pisces
1970		Virgo	Aries
1971	Aquarius	Libra	Aries
1972		Scorpio	Taurus
1973	Aries	Sagittarius	Taurus
1974		Capricornus	Taurus
1975	Taurus	Aquarius	Gemini
1976		Pisces	Gemini
1977	Gemini	Aries	Cancer
1978		Gemini	Cancer
1979		Cancer	Leo
1980	Leo	Leo	Leo
1981		Leo	Leo
1982	Virgo	Virgo	Virgo
1983		Libra	Virgo
1984	Libra	Scorpio	Libra
1985		Sagittarius	Libra
1986	Sagittarius	Capricornus	Libra
1987		Aquarius	Scorpio
1988	Pisces	Pisces	Scorpio
1989		Aries	Sagittarius
1990	Taurus	Taurus	Sagittarius
1991		Cancer	Sagittarius
1992	Gemini	Leo	Capricornus
1993		Virgo	Capricornus
1994		Libra	Aquarius
1995	Cancer	Libra	Aquarius
1996		Scorpio	Aquarius
1997	Leo	Sagittarius	Pisces
1998		Capricornus	Pisces
1999	Libra	Aquarius	Aries
2000		Pisces	Aries

Sun- and Moon-dogs

These are bright spots of light often seen in conjunction with a halo around the sun or moon. They are most beautiful if fully visible, particularly when seen at night.

They are produced by refraction of light by ice crystals in the upper atmosphere, and represent the image of the source. Most commonly do they consist of two points, one on either side of the luminary at a distance of 22°. They may also form one above and one below the sun, four in all, and when accompanied by a halo look like four beads threaded on a circular wire.

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Zodiacal Light

This is visible as a cone of light extending upwards from the horizon after sunset in March or April, and before sunrise in September, although in the tropics it may be seen on almost any night of the year.

The dimensions of the cone are variable, usually extending upwards to a point almost halfway between zenith and horizon, its base measuring about 30° along the horizon centred upon the spot at which the sun sets or rises. It may be observed to continue beyond these limits until it extends right round the sky, like a faint ribbon of light along the ecliptic. Its colour is white, possibly tinged with red, and it is always very faint.

Its origin lies in the host of interplanetary particles beyond the earth's atmosphere which reflect the sunlight, and it is similar in nature to the gegenschein, or counterglow, with which it is associated.

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