

# SkyWarn UK

## Spotter Training Handbook v3.2

# Welcome

Welcome to the SkyWarn UK Spotter Handbook. This document has been designed to give you a brief overview of SkyWarn UK and how the organisation works, as well as a basic understanding of severe weather, the hazards it can present, and basic safety steps you can take to reduce the risk. It has been designed to be the first part of our training programme, to be read prior to taking the spotter test. However, we would also recommend that you keep a copy of this document for future reference. Don't worry if you forget to save it, we will email it to you on successful completion of the spotter test.

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# A BRIEF HISTORY

# A Brief History

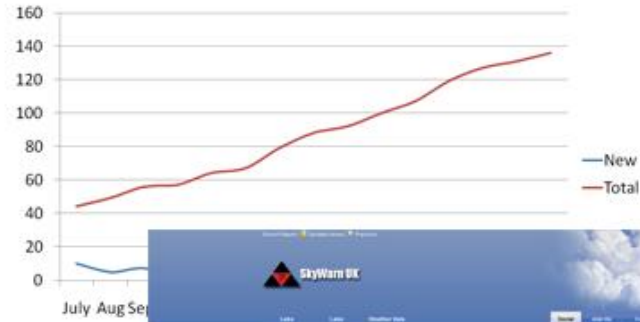
SkyWarn UK was founded in 2009 and launched on July 1<sup>st</sup> of that year. It is a member based organisation with the aim of recording and reporting specific severe weather events in order to improve forecasting and understanding of such.

Within our first year we saw membership increase to over 100, issued in excess of 30 different alerts, recorded and reported more than 40 different severe weather events, and were recognised by SkyWarn Europe as the UK's official SkyWarn group.

We currently count over 225 members and registered spotters across the UK.



## Growth

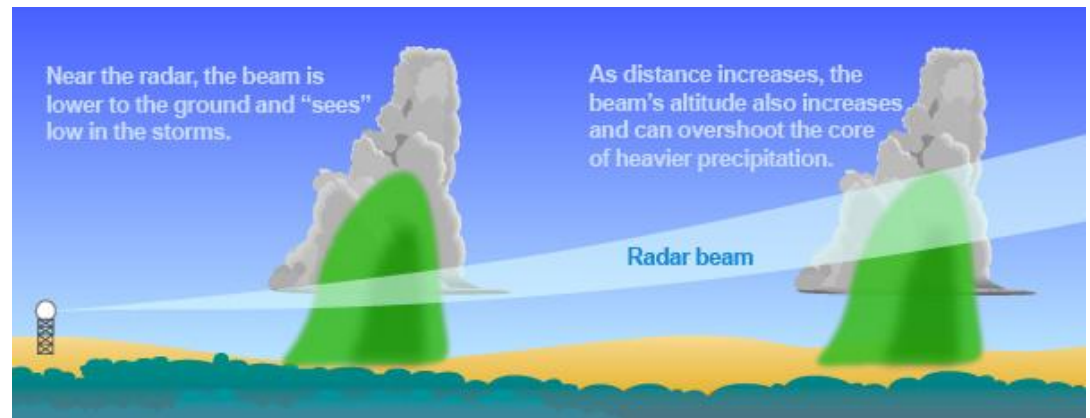


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# WHY SPOTTERS ARE NEEDED

## Radar

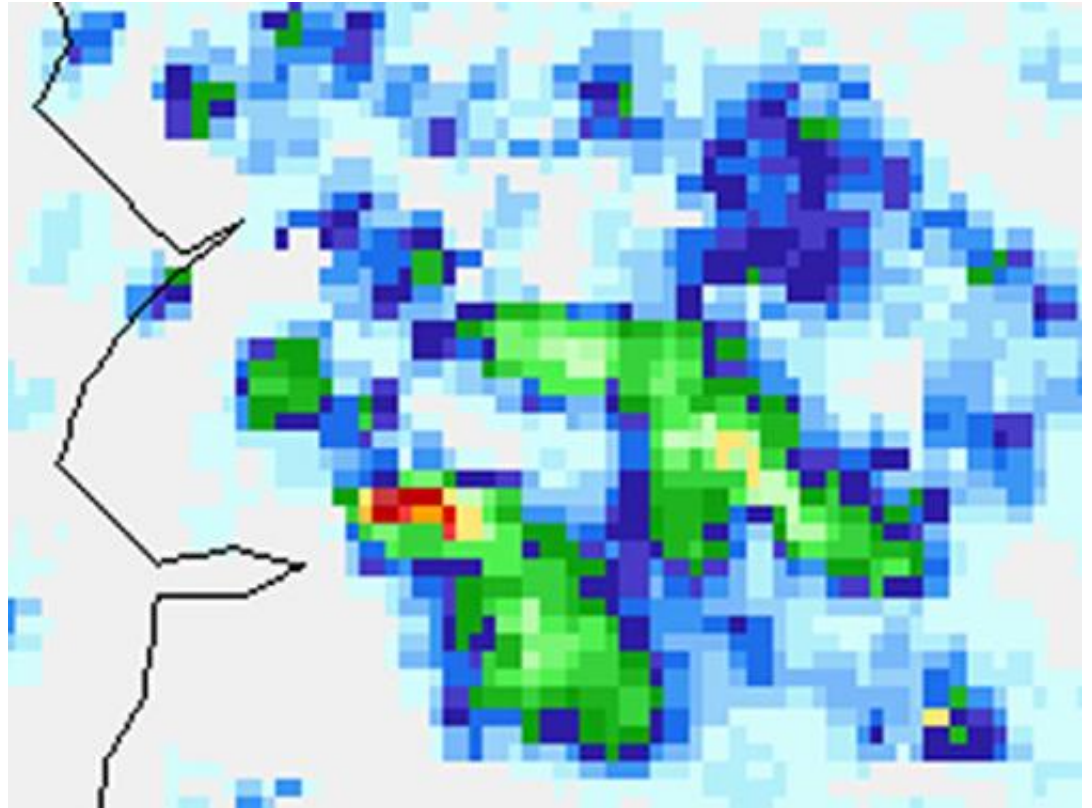
Radar is an excellent tool in the weatherman's belt, but it is only so useful. As the distance from the radar increases, so does the beam height due to the curvature of the earth. This means that while a storm near the radar will be well depicted on radar imagery, one that is further away is less likely to be so well defined. In fact, as the height of the beam is so high, the radar will not sample what's going on near the surface and the cloud base, and will miss tell tale signs of rotation, as well as heavy precipitation, in the lower levels.



## Real-Time Information

Spotters are also needed to provide real-time information from the ground. Radar cannot tell the full story. For example, this radar image shows a bright echo over west Wales. If we knew no better then we would assume it was just heavy rain. However, having someone on the ground in that area told us something different. That bright echo was actually an area of heavy rain, pea-size hail, and violent squally winds.

So, in summary, spotters are needed to be the eyes and ears on the ground whenever severe weather strikes.



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# **ALERT TYPES & CRITERIA**

## Alert Types

SkyWarn UK issues a number of alert types, dependent on the expected weather event. These are summarised below and detailed fully on the following slides:

Severe Weather Watch

Severe Weather Warning

Severe Thunderstorm Watch

Severe Thunderstorm Warning

Rarely the following alerts may be issued:

Severe Weather Warning – Particularly Dangerous Situation

Severe Thunderstorm Warning – Particularly Dangerous Situation



## Severe Weather Watch / Warning

SkyWarn UK will issue a Severe Weather Watch up to 48 hours in advance of the expected onset of certain types of severe weather. A Severe Weather Warning will be issued when the event is imminent or occurring. The events that SkyWarn UK issues watches and warnings for are:

High Winds – widespread gusts over 70 mph

Disruptive Rainfall – widespread, disruptive rainfall

Disruptive Snowfall – widespread, disruptive snowfall

Large Hail – over 15 mm diameter but not associated with thunderstorms

Tornadoes – not associated with thunderstorms but possible convergence zone tornadoes



## Severe Thunderstorm Watch / Warning

Thunderstorms are not uncommon in the UK, but severe thunderstorms are. SkyWarn UK issues a Severe Thunderstorm Watch when storms meeting the criteria below are possible within the time frame specified. A Warning may be issued if a severe thunderstorm is confirmed. In order to be classed as a severe thunderstorm the storm must have one or more of the following:

- Wind gusts in excess of 55 mph
- Large hail over 20 mm diameter
- Tornado or funnel cloud



## Particularly Dangerous Situation

On rare occasions a Severe Weather Warning or Severe Thunderstorm Warning may be tagged with the phrase 'Particularly Dangerous Situation'. This will normally only be the case for the most severe weather events such as the following:

Extreme Winds – Widespread damaging wind gusts in excess of 80 mph

Severe Snowfall – Widespread major disruption to transport and infrastructure

Severe Rainfall – Widespread major disruption to transport and infrastructure

Destructive Tornadoes – those in excess of T2 intensity



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# REPORTING

# Reporting

We have already seen why we need spotters, but without reporting what is observed, we would go nowhere. Reports submitted to SkyWarn UK are added in to our own database and may also be sent to TORRO, ESSL / ESWD, and the UK Met Office to aid in forecast verification and improvements.

Spotters should report any event meeting our alert criteria. These reports may be made by text, email, or online. We would strongly encourage you to submit your reports using [ClimaCore™](#).

The list to the right shows what should be reported to SkyWarn UK.

Events NOT associated with a thunderstorm:

- Winds in excess of 70 mph
- Hail over 15 mm diameter
- Tornadoes / Funnel clouds / Waterspouts
- Storm total rainfall when requested
- Storm total snowfall when requested

Events directly associated with a thunderstorm:

- Winds over 55 mph
- Hail over 20 mm diameter
- Tornadoes / Funnel clouds / Waterspouts
- Rotating wall cloud

## A Good Report

It is important that you provide as much information as possible when you submit your report. If possible you should include the following:

- Your spotter ID
- Location of event as accurately as possible
- Date and time of event
- Duration of event
- Whether the figure is actual or estimated (see next slide)
- Whether there is any supporting evidence, such as photos or video
- Any other details you think may be relevant

Never think your report is unimportant but also do not exaggerate.



## Estimating Wind Speed

Wind speed can be very difficult to estimate. In general, winds need to exceed 60 mph to cause any significant damage.

For trees the degree of damage is dependent on a number of factors, such as general condition of the tree, whether or not it is in leaf, and the condition of the soil. A tree in full leaf rooted in saturated soil will be easily uprooted.

For buildings, the degree of damage is dependent on age and condition of the structure, pre-existing weaknesses and damage, and others.

When estimating wind speed, it is important to consider what is known as the SET effect. This is discussed on the next slide.

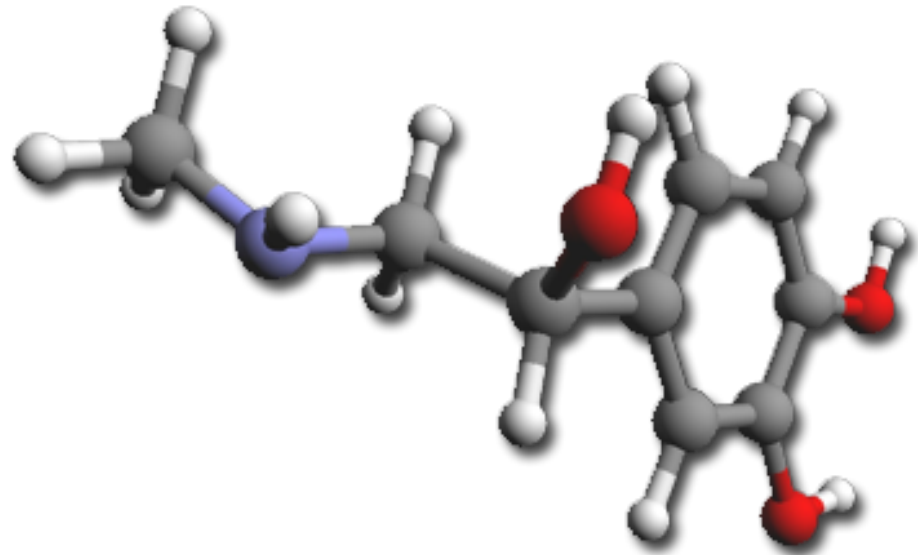
BEAUFORT	AVG MPH	KNOTS	EFFECT
0 (calm)	0	0-1	Smoke rises vertically in the air. The sea is smooth.
1 (light air)	1.2-3	1-3	Smoke moves slightly in the direction of the wind.
2 (light breeze)	3.7 – 7.5	4-6	You can feel wind on your face and hear leaves rustle in the trees.
3 (gentle breeze)	8 – 12.5	7-10	Smoke moves horizontally with the wind and small branches sway.
4 (moderate breeze)	13–18.6	11-16	Loose dust and sand on the ground move, large branches sway, loose paper blows around, and fairly frequent whitecaps occur on the sea.
5 (fresh breeze)	19.3-25	17-21	Surface waves form on the water, and small trees on land sway.
6 (strong breeze)	25.5-31	22-27	Trees bend with the force of the wind, which also causes whistling in telephone wires and some spray on the sea surface.
7 (moderate gale)	32-38	28-33	Large trees sway.
8 (fresh gale)	39-46	34-40	Twigs break from trees, and long streaks of foam appear on the ocean.
9 (strong gale)	47-55	41-47	Branches break off of trees.
10 (whole gale)	56-64	48-55	Trees are uprooted, and the sea takes on a white appearance.
11 (storm)	65-74	56-63	Widespread damage.
12 (hurricane)	75+	64+	Structural damage on land and storm waves at sea.

## The S.E.T. Effect

Severe weather spotters should always remember that during any severe weather event Stress, Excitement, and Tension levels may be running high. This is what is known as the SET effect and it can alter perception and logic abilities. Because of this, it is very easy to over-estimate wind speeds.

To illustrate, a 40 mph wind gust in otherwise fair conditions would be of little concern. However, the same wind speed experienced during a full blown thunderstorm may seem like a 60 mph wind due to the SET effect.

If you doubt your estimate, rethink it.  
Try to remain calm and objective.



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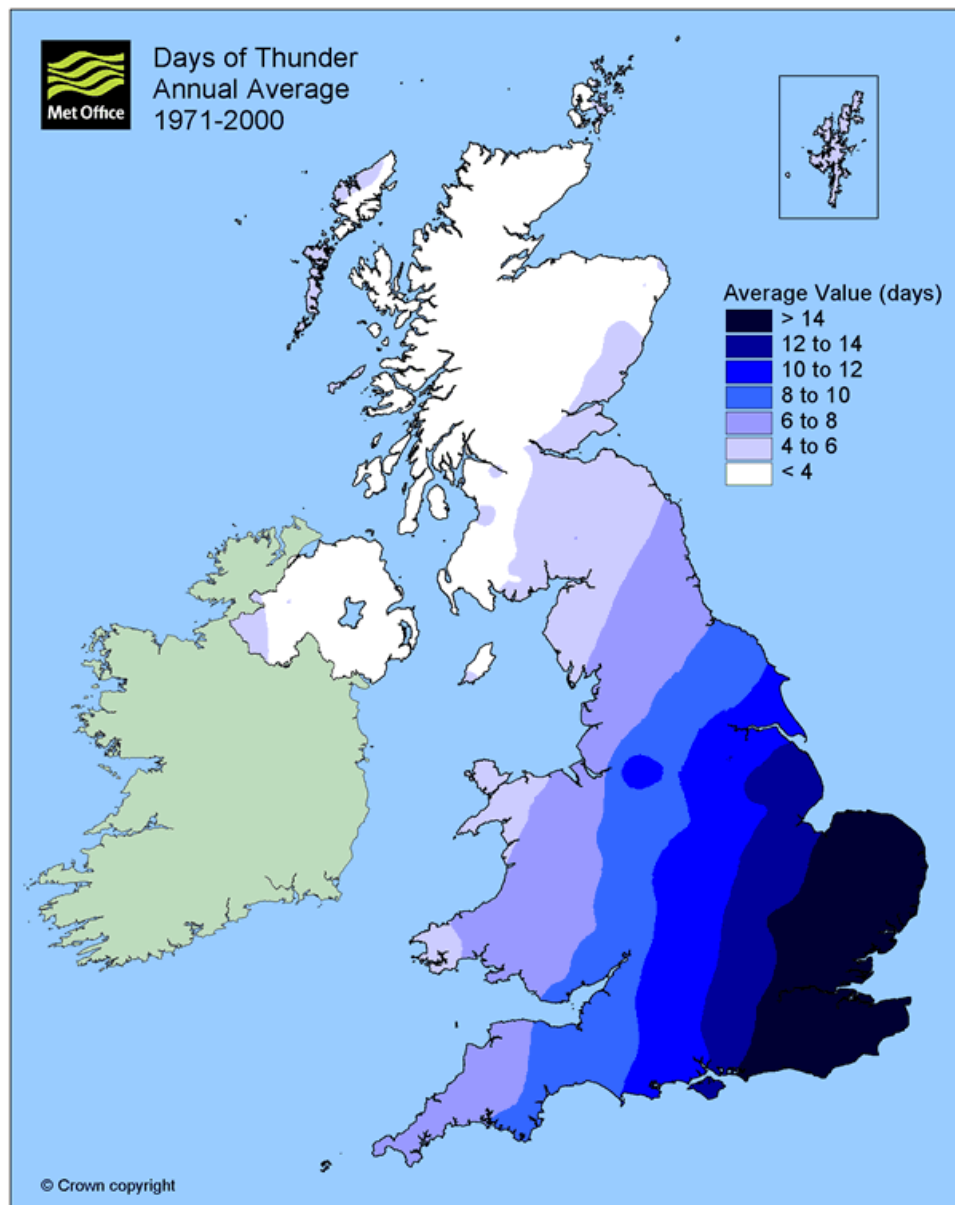
# SEVERE WEATHER CLIMATOLOGY

## Thunderstorms

Thunderstorms can occur at anytime of the year. As the map shows, the incidence of thunder decreases the further northwest you travel. Areas most at risk from thunderstorms are the southeast of England.

Thunderstorms produce lightning, one of nature's biggest killers. In the UK annual averages are:

- 300,000 lightning strikes
- 30 to 60 people struck by lightning
- 3 to 6 fatalities from lightning strikes

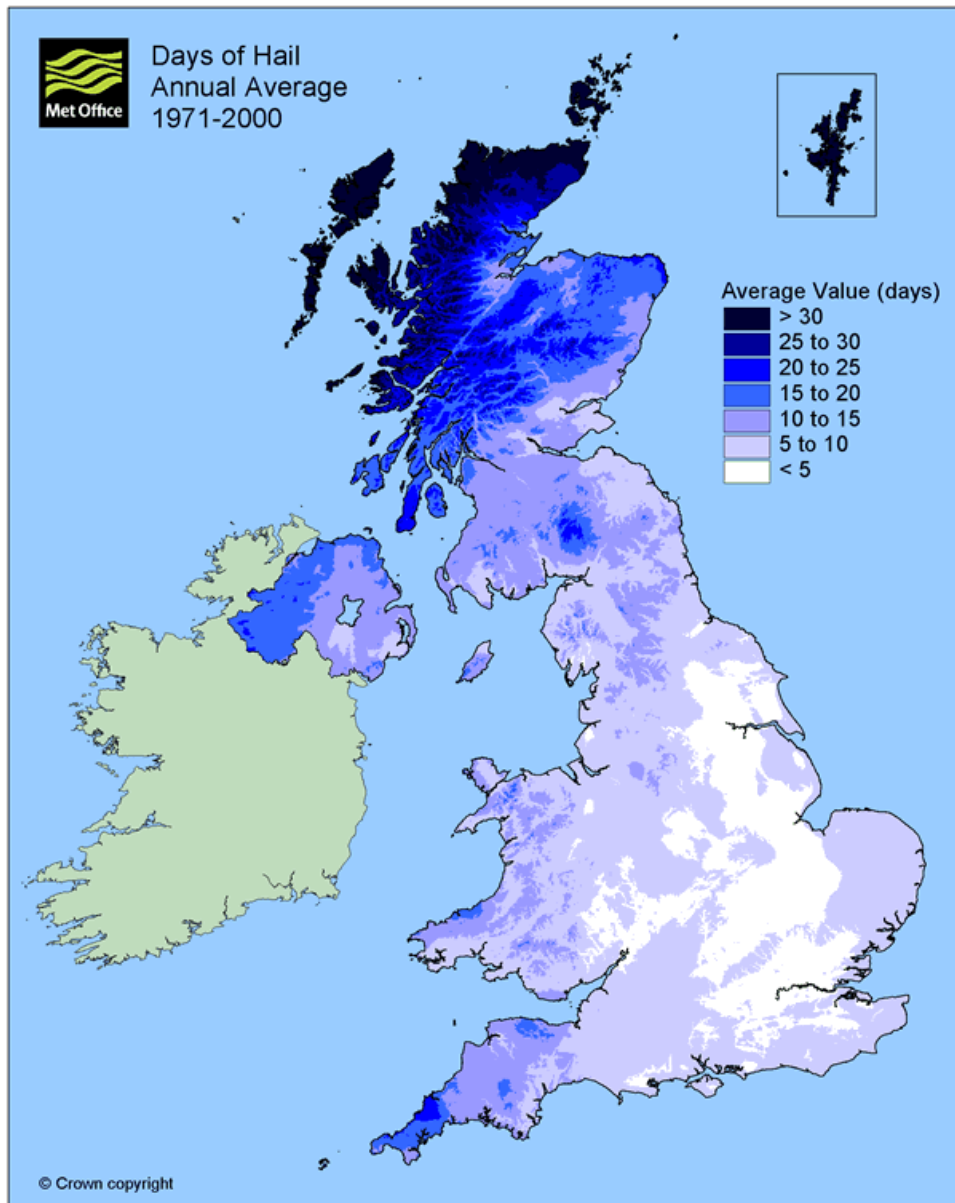


## Hail

In contrast to thunderstorms, which predominantly occur across southeastern regions, hail occurs primarily over northwestern Britain, with the far northwest of Scotland, as well as the Western Isles, Orkney, and Shetland seeing the most.

Although hail in the UK is rarely severe, there have been exceptions. Indeed, one of the worst hailstorms in the UK occurred on May 15<sup>th</sup> 1697. That storm dropped stones that were over 6cm in diameter.

While the northwest see's the most days with hail, the southeast of the UK experiences more damaging storms than anywhere else. On average, the most severe hailstorms occur between May and August, with a peak in June.



## Tornadoes

Tornadoes occur in the UK with relative frequency. There are, on average, anywhere between 40 and 60 tornadoes reported in the UK each year. The majority of tornadoes occur across southeastern parts, with the frequency decreasing the further northwest you go. Unlike hailstorms, which occur largely in the summer months, tornadoes are most likely to occur in the autumn, although they do occur less frequently at other times of the year.

Some facts:

The longest track of a UK tornado was 66.5 miles, on May 21<sup>st</sup> 1950. The tornado travelled from Little London, Bucks, to Coveney, Cambs.

Britain's strongest tornadoes have reached T8 intensity.

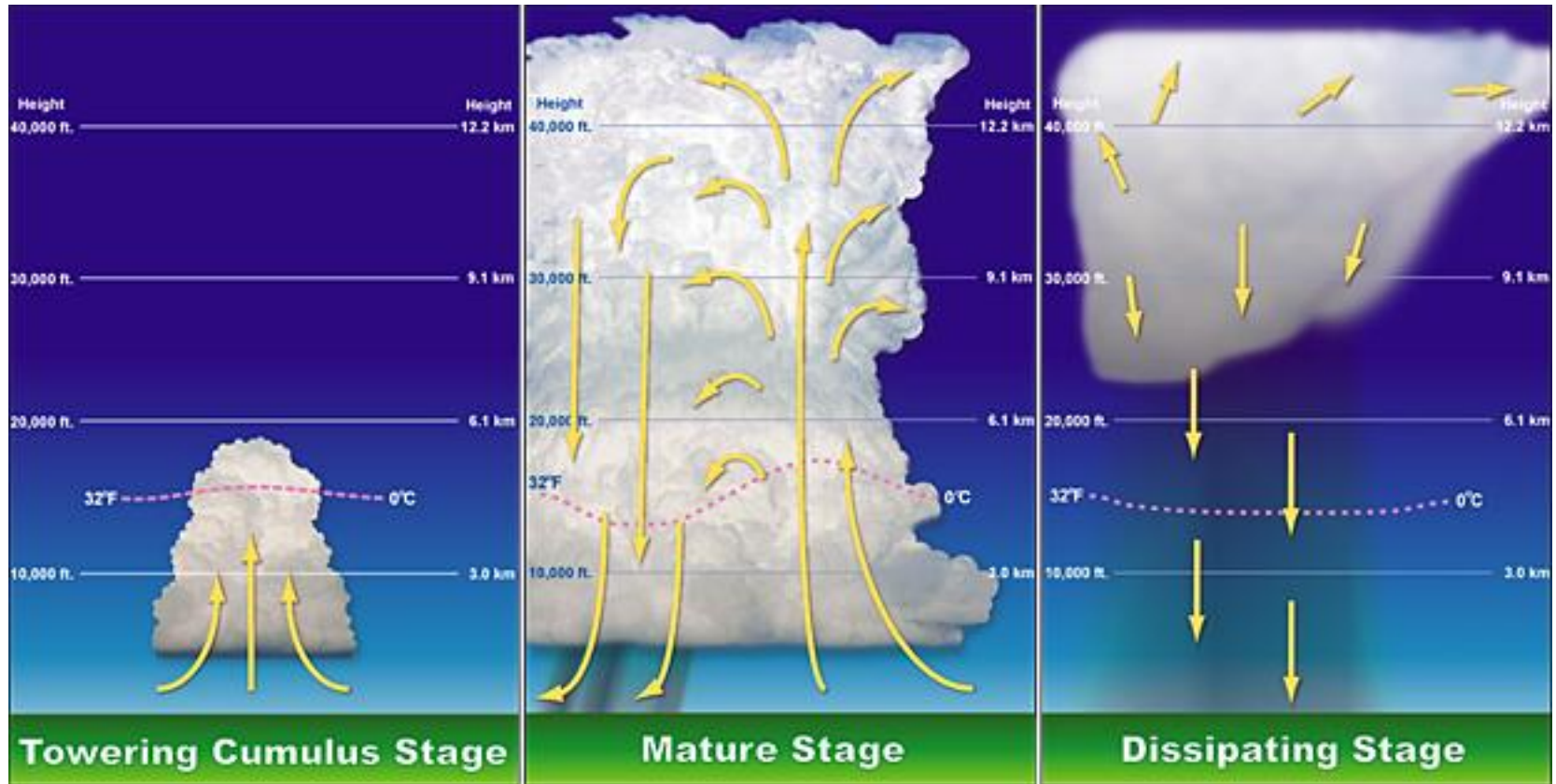
On November 23<sup>rd</sup> 1981, 105 tornadoes touched down across the UK, although no deaths occurred.



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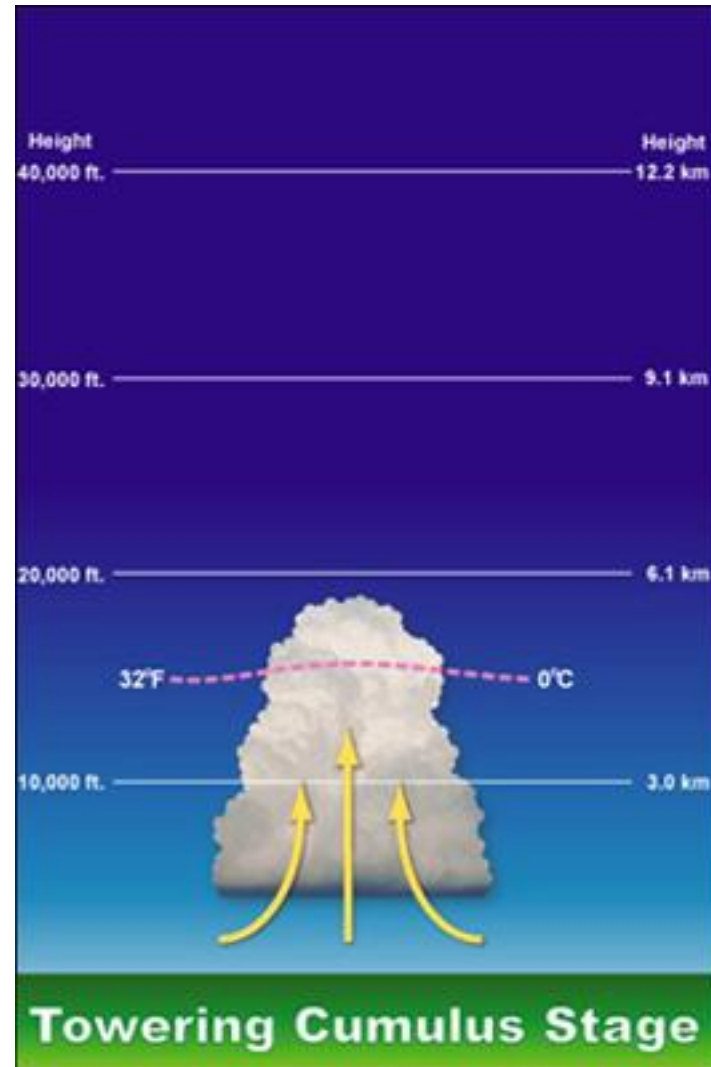
# **THUNDERSTORMS -LIFE CYCLE**

# Life Cycle of a Thunderstorm



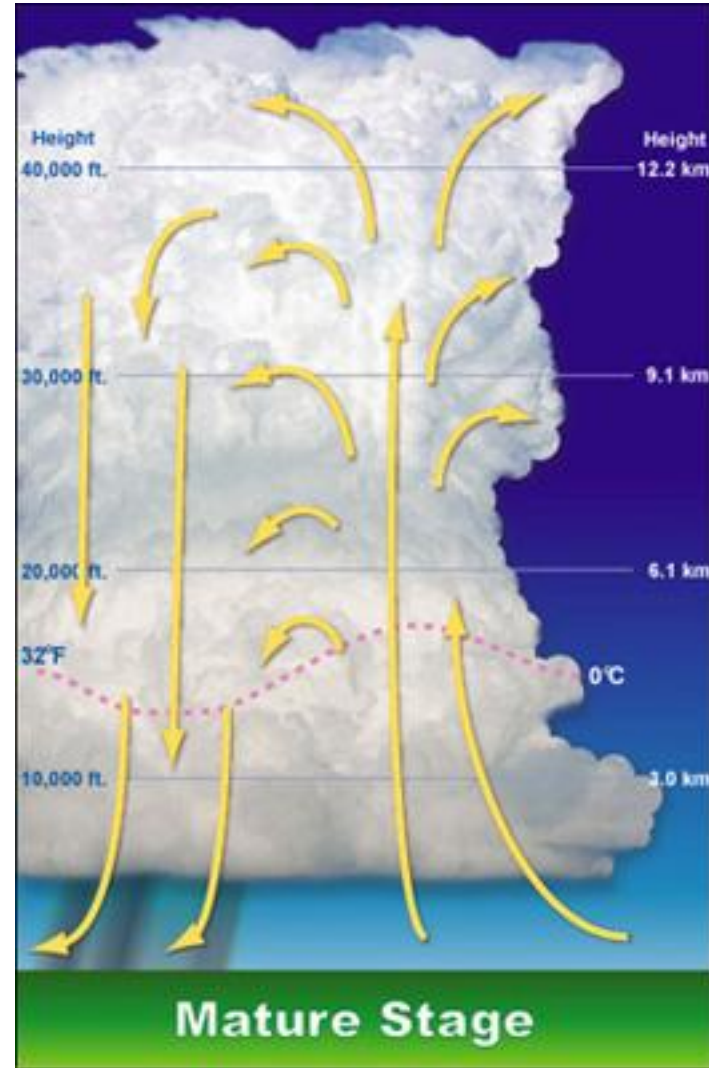
## Towering Cumulus Stage

The first stage of thunderstorm development is the towering cumulus stage. At this stage the primary activity is the establishment of the updraft. As this warm, moist air is lifted it condenses to form cumulus-type cloud structures. As the updraft continues to climb towering cumulus begins to develop. During this stage, little or no precipitation occurs.



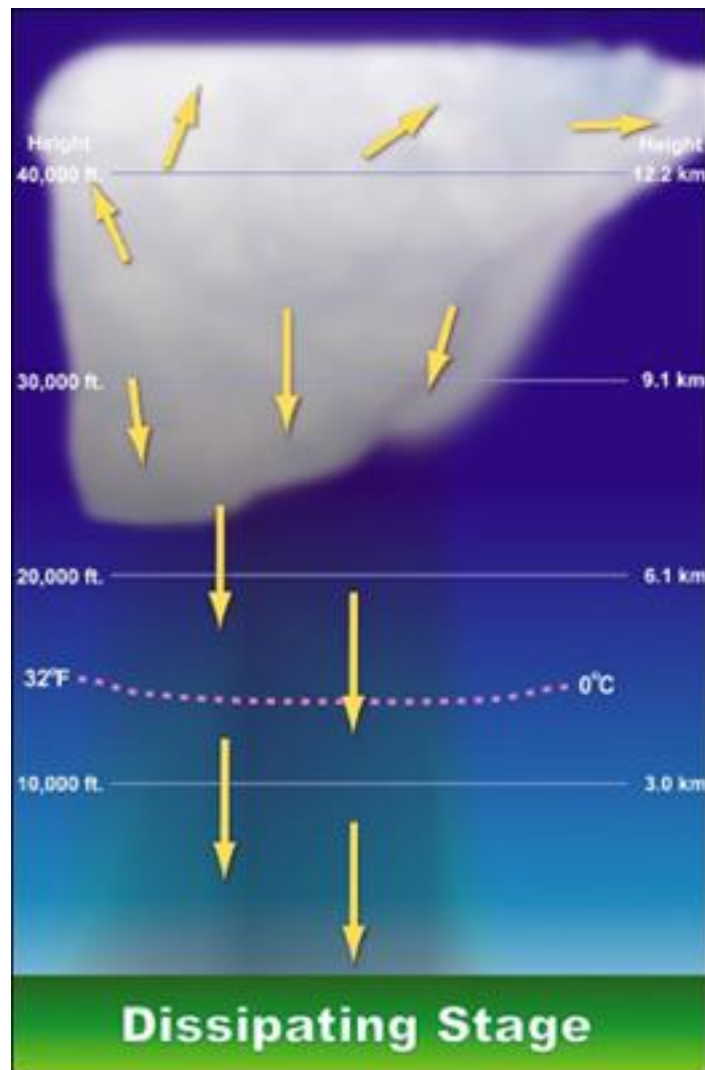
## Mature Stage

The mature phase sees the updraft continuing to rise until it can rise no further - what is known as the cap. The updraft spreads out to form what is known as the anvil. The warm, moist air begins to coalesce into small droplet. These droplet can grow to become large raindrops or even hailstones. When they are too heavy to be kept up by the updraft these raindrops or hailstones fall to the ground. As they fall they drag air down with them, creating what is known as a downdraft. During this mature phase, with both updrafts and downdrafts present, the interior of the storm can become very turbulent. This is also the time when the most severe weather is likely, whether it be damaging winds, heavy rain, large hail, or even tornadoes.



## Dissipating Stage

The dissipating stage occurs when the downdraught dominates the storm,. It pulls cooler air down to the surface and spreads out, in what is sometimes known as a downdraught or gust front. This cuts off the warm inflow into the updraft. If shear is high it is possible for the updraft and downdraught to remain separate and the storm may maintain its mature phase for several hours. However, in most typical thunderstorms the dissipating stage begins just 20 to 30 minutes into the life of the storm.



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# THUNDERSTORMS

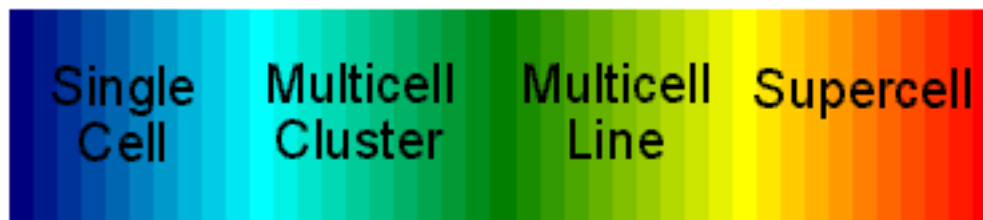
## -TYPES

## Thunderstorm Types

There are 4 main types of thunderstorm. All occur in the UK – even supercell storms.

### Single Cell Storms:

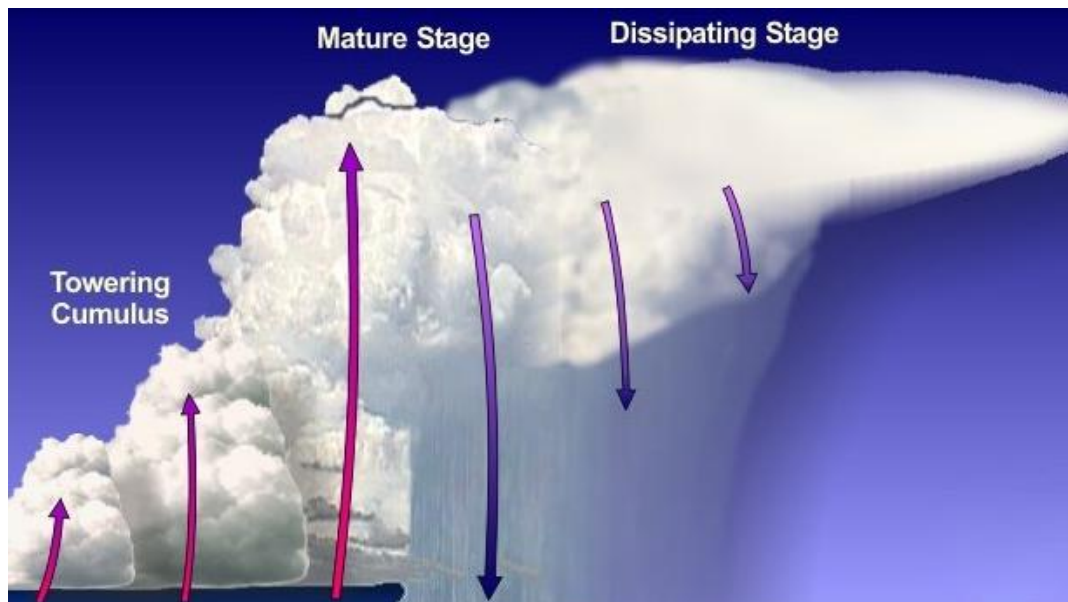
Single cell storms are the most common of thunderstorm types. They often occur in isolation, and are rarely severe. Single cell storms often form in the heat of the summer afternoon, but may also occur in cool unstable air following the passage of a winter cold front. On rare occasions single cell storms may produce pulses of severe weather, and may be termed as Pulse Storms. A single cell storm will usually last around 20 to 30 minutes.



<b>Weak updraft (non-severe)</b>	<b>Weak updraft (non-severe)</b>	<b>Weak updraft (non-severe)</b>	<b>Intense updraft</b>
<b>or</b>	<b>or</b>	<b>or</b>	<b>Almost always severe</b>
<b>Strong updraft (maybe severe)</b>	<b>Strong updraft (severe)</b>	<b>Strong updraft (severe)</b>	<b>Mesocyclone present</b>
<b>Slight threat</b>	<b>Moderate threat</b>	<b>Moderate threat</b>	<b>High threat</b>

## Multicell Cluster

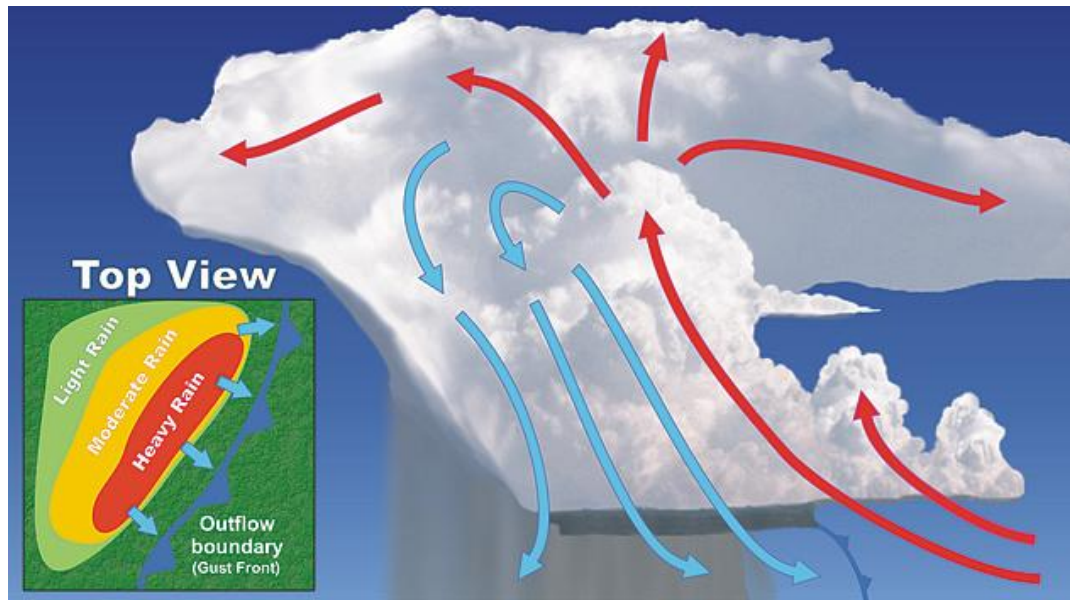
Multicell clusters, also known as back building storms or training storms, occur when more than one cell is in existence. Often the individual cells are at differing stages of development. Often the leading cell matures and is then carried downstream by upper-level winds. This allows a new cell to grow in its place. Although each individual cell grows and then moves downstream, new cells often develop in the same area as those previously. This leads to what is known on radar imagery as training, hence the term training storm. When this occurs rainfall can be substantial in areas along the path of the cells.



## Multicell Line / Squall Line

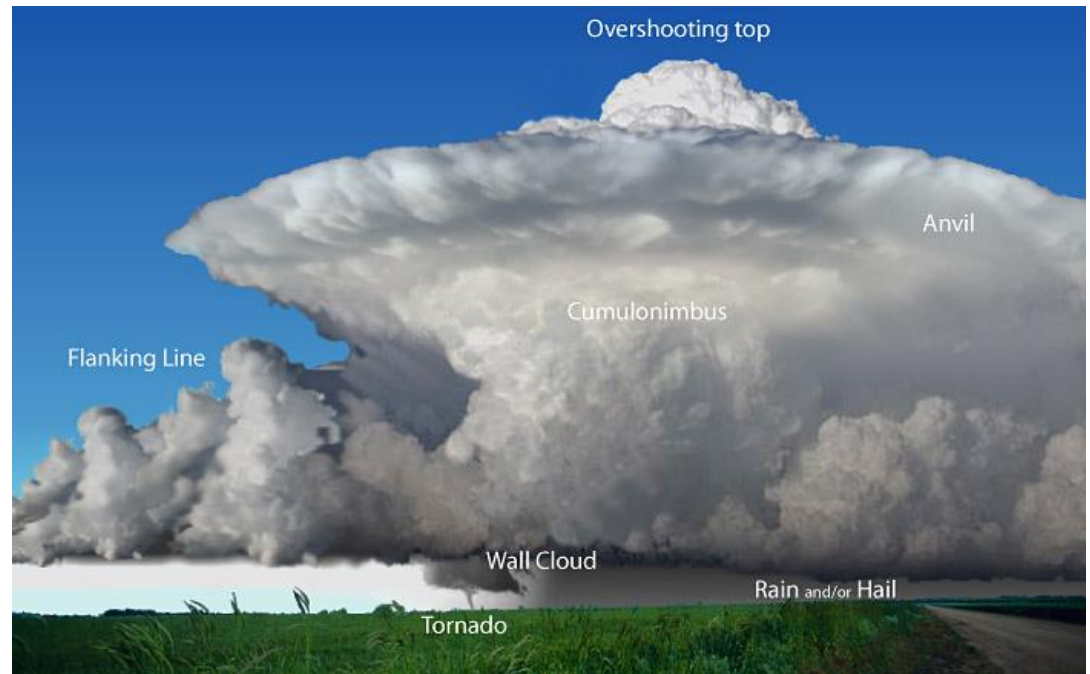
Multicell lines, often known as squall line, occur when a line of thunderstorms develop that can extend laterally for hundreds of miles. Squall lines may last for hours, and often produce damaging straight line winds and very heavy rain or hail.

Shelf clouds often form along the leading edge of the squall line. The shelf cloud is caused by cool air moving out ahead of the line of storms, acting as a mini cold front. This cooler and more dense air forces warm, moist air rapidly upwards. This warm and moist air condenses, leading to the formation of the shelf cloud.



## Supercell

Supercells are the rarest of thunderstorm types, yet they have the potential to cause the most damage. Although associated with the US Great Plains, supercell thunderstorms occur in the UK on rare occasions. UK supercells are smaller in both horizontal and vertical extent (hence they may be known as low-topped or LT supercells) and require only weak to moderate instability. They do, however, still require moderate vertical shear. LT supercells have a small mesocyclone, can produce weak to strong tornadoes, and may occur either in isolation or as part of a squall line. Recorded instances of possible LT supercells include a storm that affected the south Midlands on 21<sup>st</sup> March 2004, producing 20 mm hail and a T3 tornado and a storm that affected eastern England on July 28<sup>th</sup> 2005 producing another T3 tornado.



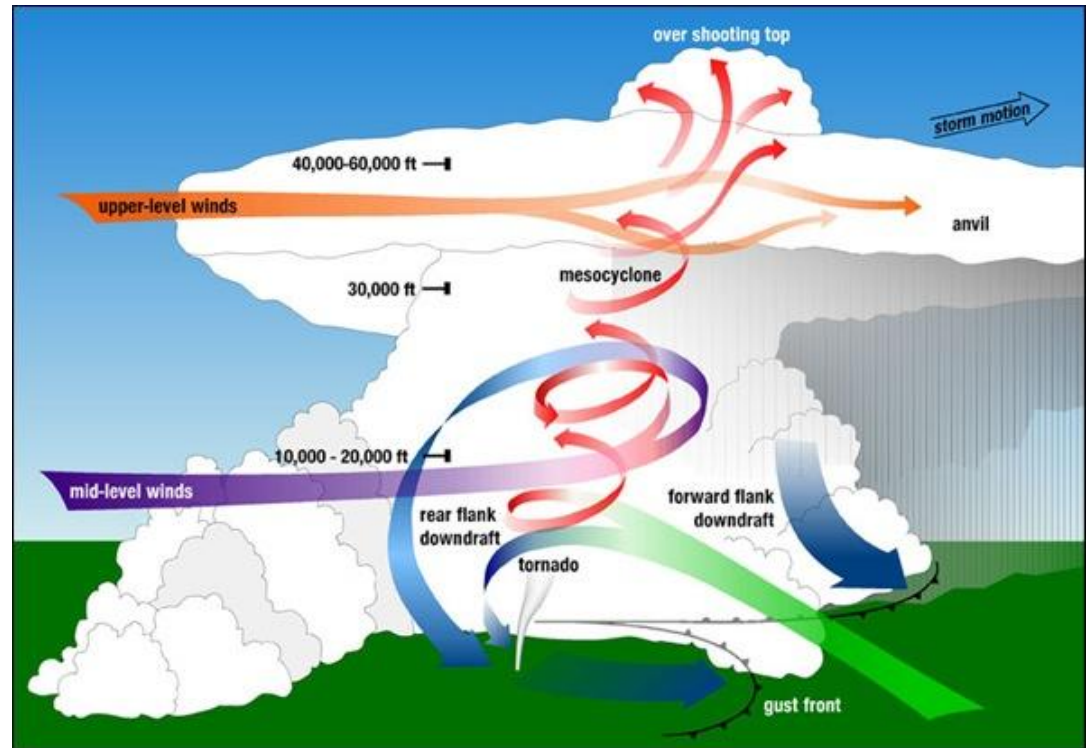
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# **THUNDERSTORMS**

## **-SUPERCELL STRUCTURE**

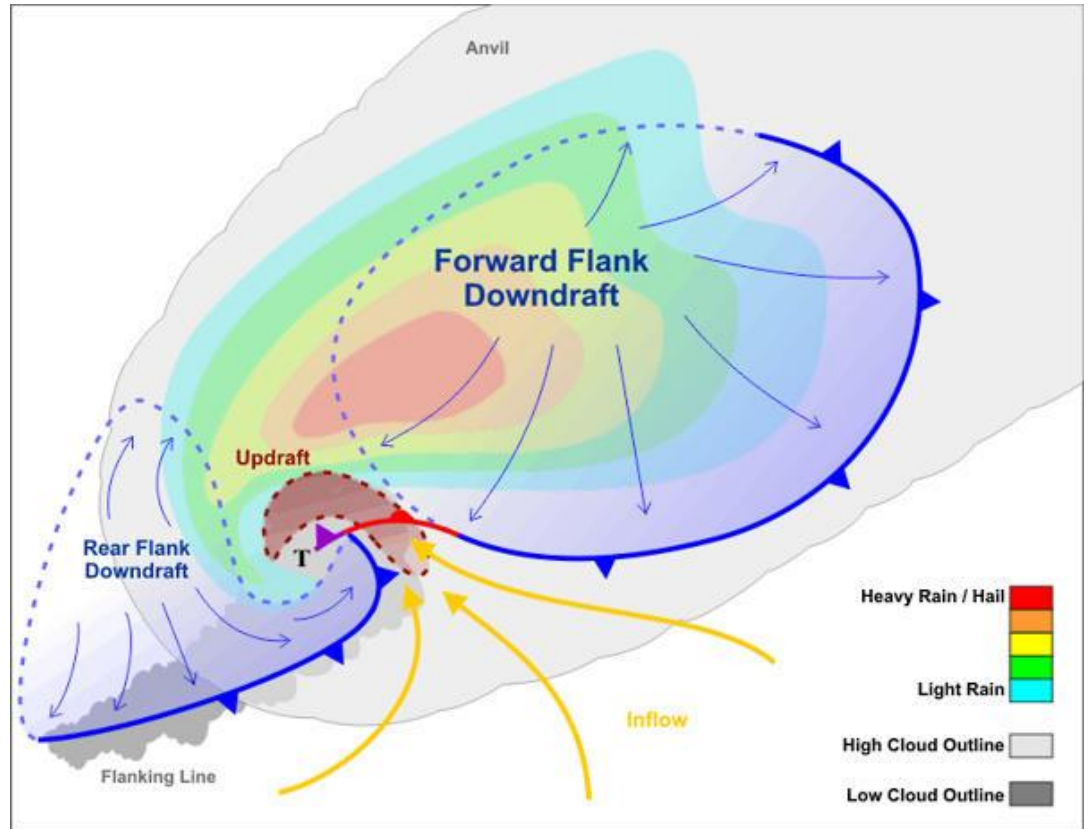
## Supercell Structure

In a supercell, the updraft and downdraft co-exist in a near steady state. Shear can cause the updraft to rotate, creating what's known as a mesocyclone. This mesocyclone can extend for thousands of feet into the atmosphere and be up to 1 mile wide. Tornadoes can occur at the base of this updraft. The primary downdraft is known as the forward flank downdraft (FFD). However, key in tornadogenesis is what's known as the rear flank downdraft, or RFD. This smaller downdraft concentrates the low level wind convergence near the updraft and enhances rotation.



## Supercell Structure (cont)

The graphic to the right shows an idealised top down view of a supercell. The curvature of the updraft shows rotation is present. The leading edge of the FFD is marked by the cold front, or gust front. The lack of precipitation near the updraft indicates that the updraft is sufficiently strong to prevent precipitation falling. The smaller RFD bring down precipitation around the rear of the updraft, and this leads to the classic hook echo seen on radar imagery. If a tornado were to form it would almost certainly occur in the area marked with a 'T'.



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# THUNDERSTORMS -COMPONENTS

# Components of a Thunderstorm

## Updraft

- Indicates inflow
- Rising warm air
- Often precipitation free, known as the Rain Free Base
- Normally located towards the rear of the storm
- Primary location for tornado

## Downdraft

- Indicates outflow
- Descending cool air, leads to gust front and shelf cloud
- Often accompanied by very heavy rain / hail
- Located towards the front of the storm

## Wall Cloud

Wall clouds occur at the base of an updraft, and are marked by an abrupt and persistent lowering of the cloud base. They form as a result of the decrease in the cloud condensation level in this portion of the storm. Wall clouds can form with any type of thunderstorm, and only indicate that a persistent updraft is present. A wall cloud is not an indicator of severe weather, and may be anything from just a few hundred yards to more than a mile wide. They may or may not rotate. Occasionally the wall cloud may develop a point that slopes down towards the precipitation /downdraft . This feature is called a tail cloud. Tornadoes may form with or without a wall cloud.



## Shelf Cloud

Shelf clouds can develop on any type of thunderstorm, and mark the leading edge of the gust front. The shelf cloud can be associated with either the front flank downdraft or the rear flank downdraft. They are formed by rain cooled air undercutting warmer surface air. The shelf cloud may be accompanied by sudden increase in wind speed or direction, and can produce damaging winds at the surface. The shelf cloud slopes down and away from the precipitation area. Shelf clouds can be associated with a squall line, and may occasionally produce gustnadoes.



# Wall Cloud vs Shelf Cloud

	Wall Cloud	Shelf Cloud
Associated with updraft	Yes	No
Associated with downdraft	No	Yes
Slopes down towards precipitation / downdraft	Yes	No
Slopes down and away from precipitation area	No	Yes
Often associated with gustnadoes	No	Yes
Often associated with funnel clouds	Yes	No
Favoured area for rotation	Yes	No

## Funnel Clouds

A funnel cloud is a rapidly rotating funnel shaped cloud that extends downward from the cloud base. The funnel cloud is usually, but not always, located near the updraft. It is almost always smooth in appearance and must be connected to the cloud.



## Tornadoes

A tornado is a violently rotating column of air that is in contact with both the cloud base and the ground. The visible condensation funnel does not have to be in contact with the ground, as long as the circulation itself is (as in the picture to the right). In general, if the visible funnel extends more than 50% to the surface, the chances are it is a tornado.

Tornadoes fall in to two categories:

- Mesocyclone produced tornadoes, normally associated with supercells
- Convergence zone, or non-mesocyclone, tornadoes. These are sometimes known as landspout tornadoes and are the most common type of tornado in the UK.



# Convergence Zone Tornadoes

As the most common type of tornado in the UK is the convergence zone tornado, the following are some key points:

- Can form in many areas of a thunderstorm or cumulus cloud
- Not associated with larger scale rotation, such as a mesocyclone
- Always connected to the cloud base
- May form along horizontal shear areas
- Can be persistent, slow moving, and destructive
- Often narrow with the same width along the entire length of the funnel
- Translucent in colour
- Not associated with wall clouds



## Gustnado

A gustnado is a small, short-lived low-level based vortex, often found along the gust front. It is not generally associated with a wall cloud, mesocyclone, or updraft. Gustnadoes are potentially hazardous to those out in the open and may cause damage.



# Tornado vs Gustnado

	Mesocyclone Tornado	Convergence Zone Tornado	Gustnado
Associated with a mesocyclone	Yes	No	No
Extends from cloud base to ground	Yes	Yes	No
Can be seen by radar	Rarely	No	No
Located along the gust front	No	Occasionally	Yes

# The International Tornado Scale

Category	Wind Speed (mph)	Damage Impacts	Category	Wind Speed (mph)	Damage Impacts
T0 Light	39 - 54	Exposed slates dislodged; twigs snapped	T5 Intense	137 - 160	Weak buildings destroyed; utility poles snapped
T1 Mild	55 - 72	Minor damage to sheds; chimney pots dislodged; fences flattened	T6 Moderately-devastating	161 - 186	Strongly built houses sustain major damage; bricks airborne
T2 Moderate	73 - 92	Mobile homes displaced; significant roof damage; trees uprooted	T7 Strongly-devastating	187 - 212	Brick and wooden frame houses destroyed; trains overturned
T3 Strong	93 - 114	Mobile homes overturned; major roof damage; garages destroyed	T8 Severely-devastating	213 - 240	Steel framed structures sustain severe damage or destroyed; cars carried
T4 Severe	115 - 136	Cars lifted; entire roofs removed; gable ends torn away; debris carried up to 2 km	T9 / T10 Intensely-devastating / Super	241 - 269 / 270 - 299	Steel framed buildings destroyed; trains carried; / entire building shifted from foundations

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# **THUNDERSTORMS**

## **-STORM STRENGTH CLUES**

# Storm Strength Clues

**Weak Storm**



**Strong Storm**



## A Weak Storm

A weak storm, or one with a weak updraft, is visibly different to a stronger storm. At a distance of 20 to 40 miles away the anvil will look light and wispy. Nearer the storm, at a distance of around 10 to 20 miles, the mid-section of the storm, or tower, will look soft and mushy.



## A Strong Storm

A strong storm, with a strong or intense updraft will display an anvil that is solid and crisp looking. You may also see what is known as an 'overshooting top'. This is a small area of cloud that protrudes above the anvil, and indicates the storm has an intense updraft, and is likely severe. In the mid-levels the core or tower will look hard and cauliflower-like.



## The Storm Base

When within 10 miles of the storm, providing visibility is good, you should be able to see the following:

Rain free base – this indicates the location of the updraft. It is often marked by a low, flat cloud base from which little or no precipitation is falling.

Wall cloud – this is an isolated lowering of the rain free base, and identifies the area where the updraft is at its strongest. Rotating wall clouds, especially those that last more than ten minutes, indicate a strong storm that may be capable of producing large and damaging hail, severe wind gusts, and tornadoes.



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# **THUNDERSTORMS -WIND SHEAR**

## Wind Shear: The Key to Storm Organisation

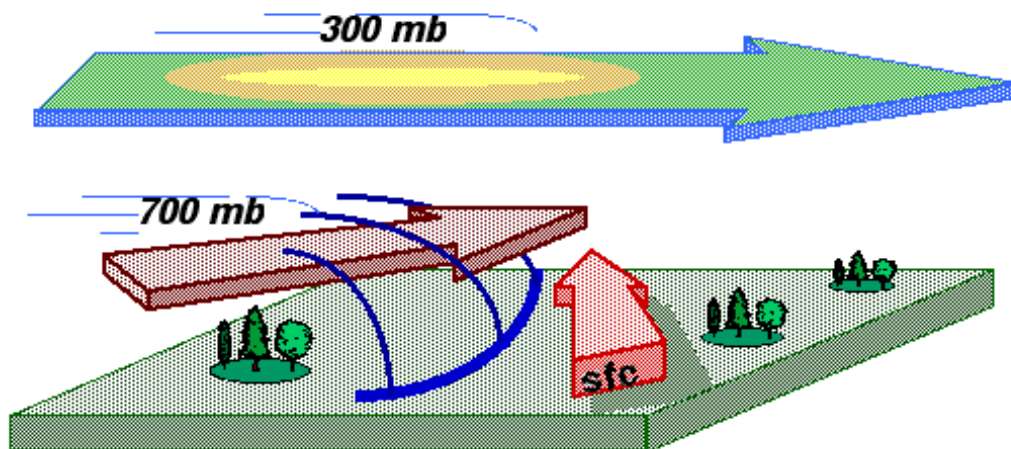
Wind shear is defined as the change in wind speed or direction with height.

In the diagram to the right note the following:

- A **SE** wind near the surface
- A **SW** wind at the 700mb level
- A **west** wind at the 300mb level

The increasing length of the arrows indicate an increase in the wind speed.

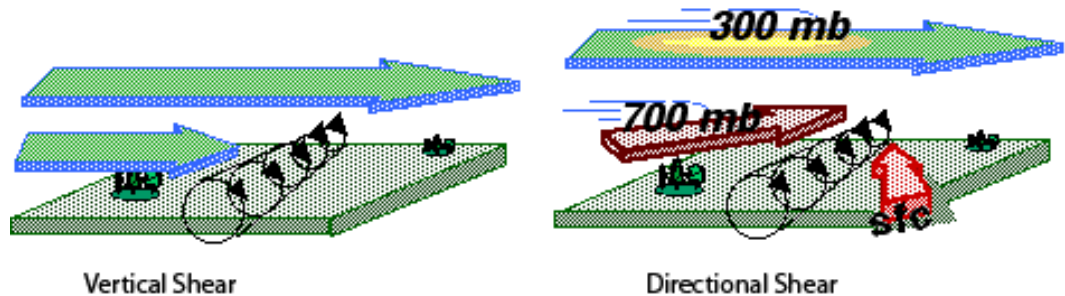
A change in wind direction with height is known as directional shear, while a change in wind speed with height is known as vertical shear.



# Storm Development in a Favourable Shear Environment Part 1

When there is a high degree of either vertical shear or directional shear air near the surface can take on a rotational tendency along a horizontal axis.

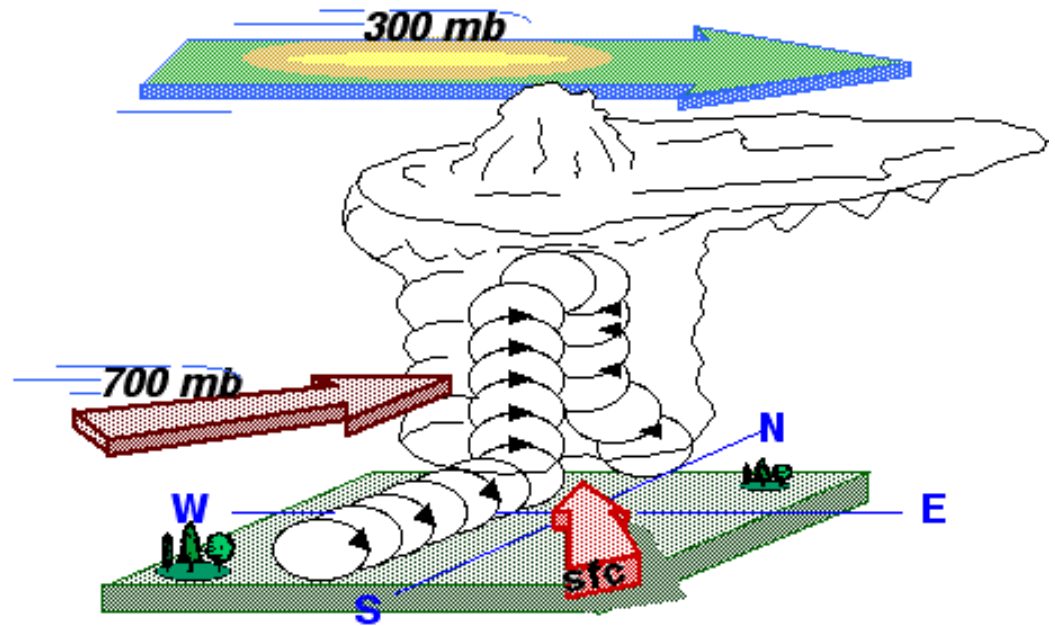
As the diagrams show, winds that increase significantly with height can create a tube of air which rotates along a horizontal axis, almost like a pen rolling along a table. Winds that change dramatically with height can also have the same affect.



## Storm Development in a Favourable Shear Environment Part 2

Having established a horizontal rotating tube of air near the surface, we now need to look at what happens when a thunderstorm updraft occurs in the same region.

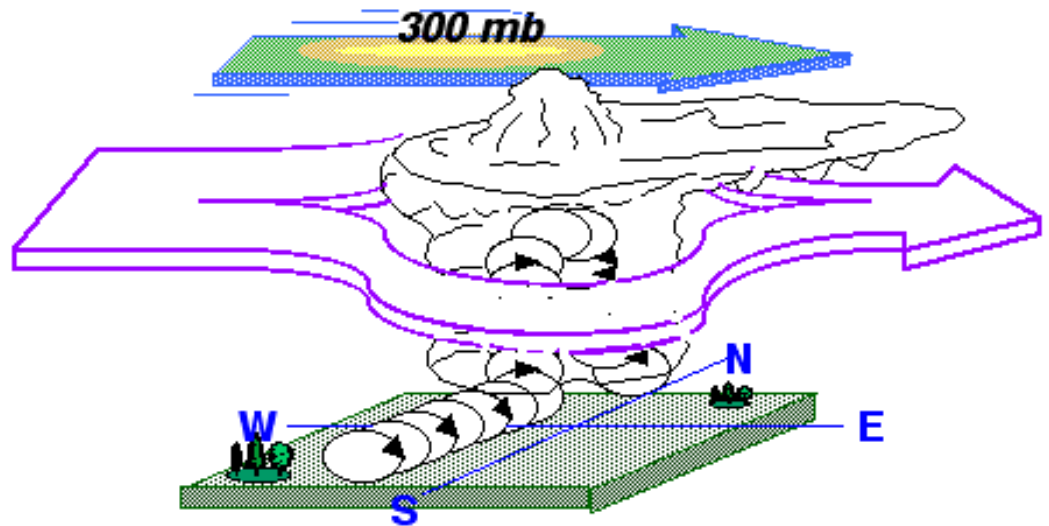
As we can see from the diagram, a thunderstorm updraft can tilt this rotating column of air vertically. This forms two vertically rotating vortices – the northern one rotates anticyclonically and the southern one rotates cyclonically. It is this cyclonically rotating updraft that becomes the mesocyclone.



# Storm Development in a Favourable Shear Environment Part 3

In a well developed thunderstorm, its own mass can act as a barrier in the upper level wind flow. As we can see to the right, upper level winds are forced around the storm.

The setup covered in the 3 parts show how in the right shear environment the stage can be set for an organised, steady state storm where the downdraft does not act to choke of the warm, moist inflow the storm needs to survive.



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# **OTHER PHENOMENON**

## **-HAIL; RAIN FOOT; MAMMATUS**

# Hail

As we have already seen, hail is not uncommon in the UK, with the northwest seeing hail on average 30 days of the year. Below are some facts about UK hail:

- Hail can range in size from just a few mm to more than 6 cm in diameter
- Hail can occur in any strong local storm, not just thunderstorms
- Requires a moderate to strong updraft
- Hail bearing clouds may have a green tinge
- Poses a real threat to crops, glass houses, roofing, skylights, and cars
- Spotter should report hail over 15 mm diameter
- Hail in the UK is classified using the H-Scale, shown on the next slide



# The H-Scale

Category	Typical Diameter (mm)	Damage Impacts	Category	Typical Diameter (mm)	Damage Impacts
H0 Hard Hail	5	None	H5 Destructive	30-50	Glass smashed; tiled roofs damaged; risk of injury
H1 Potentially Damaging	5-15	Slight damage to plants and crops	H6 Destructive	40-60	Brick walls pitted; significant risk of injury
H2 Significant	10-20	Significant damage to plants and crops	H7 Destructive	50-75	Roof severely damaged; risk of serious injury
H3 Severe	20-30	Damage to glass and plastic; paint scored	H8 Destructive	60-90	Severe and widespread damage
H4 Severe	25-40	Widespread damage to glass; some car damage	H9 / H10 Super Hailstorm	75-100 / 100+	Extensive structural damage; risk of fatal injuries

## Rain Foot

A rain foot is an outward deflection of falling precipitation, often a rain shaft, by surface winds. A rain foot may be an indication of strong downburst winds, but cannot be used to gauge surface wind speeds.

Blowing dust or soil may be called a dust foot, and is often caused by the same strong surface winds.



## Mammatus

Mammatus clouds are relatively uncommon. They usually form on the underside of a thunderstorm anvil. While not an indication of a severe storm, mammatus clouds do indicate that the storm has, or has had, a very strong updraft. Mammatus clouds can be quite long lived.



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# SEVERE WEATHER SAFETY

## Spotter Safety

As a spotter your first responsibility is safety – that of yourself and that of others. It is important you follow these basic steps when spotting, and heed the advice on the following slides.

- Follow the 'Right Hand Rule' – when observing the storm it should be moving from your left to your right
- Know where you are
- Know where the storm is
- Know how the storm is moving
- Try and maintain at least a 1 to 2 mile buffer between you and the storm
- Have an escape route
- Try and spot in pairs
- Avoid dirt tracks
- Park well of road but not near power lines
- Do not shelter under bridges or overpasses.



## Lightning

Lightning is one of nature's killers. As we saw earlier around 30 to 60 people are struck by lightning in the UK each year. The following points will help minimise the risk of being struck:

- The safest place to be during a lightning storm is indoors
- Keep away from windows, electrical appliances, and pipe work
- Do not use the telephone
- If outdoors, the safest place is in your vehicle
- Do not park near overhead power or telephone lines
- Avoid being the tallest object around, or being near the tallest object such as isolated trees
- If you can hear thunder then you are within striking distance for lightning



## Heavy Rain / Flooding

Flooding can happen quickly and with little warning. Follow these steps to ensure you are not caught out:

- Monitor the latest forecasts when heavy rain threatens
- If flooding occurs, move to high ground
- Avoid areas already flooded, especially if the water is flowing quickly. DO NOT attempt to cross flowing water.
- The road surface may be washed out under flood waters. DO NOT attempt to drive through flooded roadways.
- If your vehicle is suddenly caught in rising flood waters, leave it immediately for the safety of high ground.
- Be especially cautious at night when it is harder to see flooded areas
- To use a phrase common in the USA:  
**TURN AROUND, DONT DROWN**

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# WHAT NEXT

## What Next?

You have now reached the end of the SkyWarn UK Spotter Handbook. This handbook has been designed to give just a basic understanding of severe weather, especially thunderstorms. We hope you will consider completing the program by taking the SkyWarn UK Spotter Test and becoming a registered SkyWarn UK Spotter. The link to the test, made up of 25 questions, can be found on the 'Join Us' page of the SkyWarn UK website. A pass mark of 80% is required, but if you score less than that you are welcome to retake the test at anytime.



The End.