Cedric Johns looks at the common but misunderstood phenomenon lightning and examines the best way to avoid being struck

Bolt from the blue

Despite what we may think, this country is fortunate that in general terms, our weather patterns do not generate electrical storms with the same intensity as those experienced in other parts of Europe - say in Southern France, Spain or Portugal - nevertheless, when lightning strikes it can be lethal, especially on the wide open spaces of golf courses.

Lightning is responsible for thought provoking fatality rates: in the United States for example, lightning strikes kill over one thousand people each year, causing severe injuries to another 1,500 - 2,000 individuals.

Before dismissing these figures with the thought that America is far removed from the UK golfing scene, be aware that although lightning strikes in this country are not as common as overseas, statistics indicate that the number-and severity-of electrical storms has increased, especially in southern England.

A lightning strike, causing damage, personal injury or worse, a fatality on any golf course is one strike too many. When, last year, a player was injured by lightning at The Wisley Club, club officials reacted with commendable responsibility.

Having taken advice, they decided to minimise the risk of similar, future incidents by installing an electrical storm warning system to protect players and green staff out and about the 36-hole course.

Known as ESID - Electrical Storm Identification Device - the system, already in use in this country on R&A tournament courses, and at home and overseas on the PGA European Tour circuit, is the first to be specified by a British golf club.

Supplied and installed by the Hydroscape Group, the ESID display unit, located inside the Wisley pro shop, is designed to project visual information indicating the presence, range and direction of cloud to cloud and cloud to ground lightning discharges, the moment they happen.

Coverage - through 360° - is impressive. Working on a 30 mile radius, the detection systems reaches out to St Albans to the north, Worthing, in the south, as far as Tunbridge Wells, in the east, and westwards, as far as Basingstoke, covering some 2,800 - square miles.

When the detection unit registers two cloud to ground lightning strikes within a ten - mile radius or one, within five miles of the club, it automatically triggers an (optional) alert controller which sets off warning sirens located at predetermined points around the golf course, giving players and greenkeeping time to vacate the area.

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Above: The Hydroscape ESID warning system

The unit's digital display information can be varied by programming it to indicate other warning thresholds. In addition to safeguarding people out on the course, warnings provided by the ESID detection system also enables greenkeeping staff to switch off irrigation controllers (or other, sensitive electrical equipment) to minimise the risk of damage caused by lightning strikes.

What is lightning? Physically, lightning is an exchange of an electrical discharge between clouds or from cloud to the earth's surface. Such exchanges travel at the velocity of almost one third the speed of light, with current levels running as high as 35,000-40,000 amperes, generating one million volts or more.

In addition to electricity, lightning - more particularly a bolt - superheats the surrounding air to temperatures to an almost unbelievable 50,000 degrees centigrade. That's five times hotter than the sun's surface.

Lightning originates from thunderclouds - typically "charged" cumulonimbus clouds. The classic thunderbolt is essentially an electric dipole with a positively charged region above a negatively charged region.

Two theories exist as to how clouds are electrified: according to the convective theory, cloud droplets trap ions in the atmosphere which are moved by convective currents within the cloud to produce charged regions.

Alternatively, the gravitational theory suggests that the heavier negative particles tend to be the lower portion of the thundercloud due to gravitational attraction. Whichever, a charged thundercloud is an unstable entity. Electric fields emitting from thunderclouds can become so strong that they cause an electrical breakdown of the atmosphere.

When this happens, a charge is exchanged via a lightning flash travelling in four possible routes: from cloud to cloud, cloud to ground, from cloud to air or within the cloud itself.

Cloud to ground lightning flashes have three distinctive parts, each occurring in microseconds: the stepped leader and the dart leader. The stepped leader involves the transfer of the charge from cloud to ground along the path of least resistance, in a succession of steps.

This transfer can sometimes follow different paths resulting in what we know as forked lightning. When the stepped leader gets close to the ground it induces corona discharge (dielectric breakdown in the air, which we call St Elmo's Fire) from tall objects - like isolated trees, pylons, church steeples - which literally 'reach out' to the leader.

Connection between the leader and the discharge 'closes the circuit' and establishes an unbroken path between cloud and the ground. This triggers a powerful, upward return stroke which ends in the originating cloud.

The lightning flash may end there or, if the return stroke imparts enough charge to the cloud, a dart leader may emit from the cloud and return in a direct path to the ground. A kind of double whammy!

This dart leader can be powerful enough to induce a second, return stroke. On average, a single lightning flash consists of the three or four return strokes but flashes of up to thirty return strokes have been monitored.

There are also two kinds of cloud to ground lightning: a positive flash which transfer a positive charge, the negative, which as it suggests, exchanges a negative charge with the ground. Usually consisting of a single stroke, positive flashes are potentially more dangerous as continuous currents created can last up to ten times longer than a negative flash.

That said, you don't need to be an expert to recognise a thunder storm. Not only can you hear the rumble of thunder (thunder, incidentally, is the consequent shock wave from the electrical discharge) you can see lightning.

When this happens and you are caught out on the golf course bear in mind the following: avoid solitary trees, open areas, waterlogged areas and high ground. Avoid all metals objects including sprinklers, fences, machinery, flag poles, power lines, telephone lines and unprotected, small open sided buildings.

If you are in a group, spread out, allowing at least twenty feet distance between yourself and the next person.

In contrast, seek shelter in a substantial building or fully enclosed metal vehicles - like a car, van or 4x4 - ensuring that all windows are closed. If these are not within walking distance, look for cluster of small shrubs or trees or find a ditch, trench or low ground as refuge.

Leave mowers, small pick-ups or golf buggies behind you. Take off any form of metal objects you may be wearing, watches, chains and the like. Clubs and umbrellas should also be discarded.

More sensibly, the next time you are out on the course and you hear or see thunder or lightning, forget about edging that green and raking bunkers or if you are playing, finishing that hole. Walk off, the risk is not worth taking, remember the fates can strike with lightning speed …

In this day and age, golf clubs, playing members and greenkeeping staff have a duty to each other and themselves to take all necessary precautions to reduce the risk of injury or worse caused by lightning strikes. The R&A, PGA European Tour and now the Wisley club have taken the initiative by using ESID detection systems. Maybe your club should think along similar lines. Discuss.

Readers wishing to learn more about the storm detection systems mentioned in this article can consult Peter Roberts, the Hydroscape Group, telephone 01425 476261 or contact Cedric Johns on 01202 311345 or 01425 614790