Irish Meteorological Society

Newsletter

Number 17 **July 1989**

This newsletter contains :

(a) The text of the lecture delivered by Mr G. McDonald, entitled "Aviation Meteorology Today," as part of the one-day meeting of the Society which took place on Saturday 8th April 1989.

(b) Three articles from the Monthly Weather Bulletin of the Meteorological Service which are reproduced with the permision of the Service.

Items for Newsletter : Members are invited to submit letters or articles on matters of Meteorological interest to the Secretary for publication in future issues of the Newsletter.

Renewal of Subscriptions : Members who have not yet paid their subscription for 1989 should do so immediately by sending a cheque (payable to **The Irish Meteorological Society**) to the following address :
The Treasurer,
Irish Meteorological Society,
c/o Meteorological Service,
Glasnevin Hill,
Dublin 9.
The fee is **£8** for members in the Dublin area; **£4** for members outside this area.

Aodhagan Roddy
President

E.Cusack / J.Hamilton
Joint Acting Secretary

Some Old Sketches of Cloud-Pendants

In 1920 for the *'Meteorological Magazine'*, Mr J. Ernest Grubb, of Seskin, Carrick-on-Suir, forwarded some interesting sketches of cloud-pendants observed at Dunmore in 1816 by Robert Jacob. The sketches represent the aspect presented to an observer looking north towards Killea Hill. The following is Jacob's account of what he saw:-

"Towards the latter end of summer 1816, while walking in the fields near the village of Dunmore at the entrance of Waterford Harbour, about 2 o'clock in the afternoon, I observed a gloomy appearance towards the north, which was evidently a heavy and partial shower of rain; the cloud from which it proceeded was of that form known by the name of nimbus, at no great distance, approaching me, being borne along by a gentle breeze. I had not long observed it when the margin next me, which was well defined, presented an unusual appearance in two places, as represented in the sketch marked **A**. These appendices had a very rapid spiral motion, and repeatedly increased and decreased; that to the left extended downwards and soon became much longer; it again contracted and in contracting assumed a very remarkable form which was indescribably beautiful and interesting. No sooner had it taken this peculiar shape, delineated in the sketch marked **B**, than it increased to a considerable length, every part still preserving the rapid spiral motion as at first. It continued to play in the air and extend itself toward the earth, and after some time it suddenly assumed the form represented in the sketch marked **C**. The second one disappeared, having retained the rapid spiral motion to the last. The other seemed for a short time to detach itself from the margin of the cloud, and something of a similar nature made its appearance near the earth; they approached, united, and formed the waterspout delineated in the sketch marked **D**. By this time it was not far from me, the spiral motion extremely beautiful from the margin of the cloud to the earth. The shower soon reached me, but ere I felt the falling drops of rain this curious phenomenon had disappeared".

"The rain was very heavy in that part of the country over which the cloud had passed. I had no instruments near me to ascertain the temperature of the atmosphere, height of the barometric column or quantity of rain which fell. The shower passed on to the wide extended ocean and nature resumed her smiling aspect".

AVIATION METEOROLOGY TO-DAY.

Gerry McDonald, Meteorological Service.

The first Weather Map - based on 30 year old data - was composed in 1816. Buys Ballot discovered the relationship between wind and pressure in 1857 but Meteorology could never have developed but for the invention of the electric telegraph by Samuel Morse in 1844.

The first successful flight of an engine powered aircraft took place in 1903. While it could not be said that meteorology originated with aviation, nevertheless the establishment and expansion of meteorological services in many countries, including Ireland,have been closely linked to aviation requirements.

With the development of the first usable Radio-Sonde, providing vital information on the upper air in 1929 and the improvement in the construction of aircraft in the early nineteen thirties, (all metal, streamlined with retractable landing gear) aviation and meteorology developed side-by-side. Every advance in telecommunications was quickly exploited by both, particularly by meteorological services, who undoubtedly were valued customers of the industry.

The Irish Meteorological Service was established in 1936. It set about expanding the sparse network of observing stations in the country and organising a forecasting service for the experimental sea plane transatlantic flights from Foynes. An extract from the review by S G Cornford of the UK Met Office of the publication 'The Irish Meteorological Service 1936 - 1986' is worth noting - "To quote names of the living would be invidious, but it must be said that the forecasting talent brought together at Foynes to support the beginnings of transatlantic air travel can rarely if ever have been matched".

The first scheduled passenger flight arrived in Foynes on 28th June 1939. Documentation for the departure flight consisted of twelve to eighteen pages of very detailed forecast information for the route, - flight level about 2000 feet,- the forecasts for departure, destination and alternate ports and advisory information supplied by the destination forecast centre for the second half of the route, for consideration. Actual and forecast charts of conditions at surface level were also supplied.

About 8 - 10 (crew and operational ground staff) attended the forecaster's pre-flight breifing. After take-off major position reports were received every hour, with simpler ones every half-hour, of wind, temperature and cloud.

By 1945 land planes had taken over from the flying boats. The Dublin Airport forecasting office opened in 1943 and assumed responsibility for cross channel flights and for forecasting for the Air Corps and the Defence Forces generally. Radio-Sonde observations commenced at Valentia Observatory, Cahirciveen the same year. In 1945 a forecast office opened at Rineanna (Shannon Airport), replacing that at Foynes.

Very heavy demands were now placed on these offices, particularly Shannon with the requirement for forecasts of wind, temperature and weather up to 18,000 feet. Instead of separate route forecasts for individual flights, the practice of providing a chart of significant weather suitable for all flights within a specified period on the North Atlantic and other routes, was introduced.

Recognising the need for international co-operation the International Civil Aviation Organisation (ICAO), replacing the International Commission for Air Navigation (ICAN), was established in 1947. The World Meteorological Organisation (WMO), with governmental status, replaced the International Meteorological Organisation (IMO) in 1951 and a working arrangement between the two bodies was established. The synoptic network of observations was expanded. Observing practices and the coding of observations were progressively modified so as to be intelligible internationally and where appropriate to flying personnel. The availability of reliable observations at aerodromes of

the following elements, was considered a basic requirement:-

Wind Direction and Speed; (Selection of runways and determination of maximum take-off and landing weights).
Temperature; (Engine performance and required take-off speed).
Weather; Visibility;
Pressure and Altimeter Settings; (QNH and QFE).

Various teleprinter networks, the GTS (Global Telecommunications System), EMTN (European Meteorological Telecommunications Network),MOTNE (Meteorological Operational Telecommunications Network, Europe), AFTN (Aeronautical Fixed Telecommunications Network), facilitated rapid exchange of surface (SYNOP) and upper-air (TEMP) observations, aerodrome weather reports (AERO later METAR) and forecasts (TAF), warnings (SIGMET) etc.

The dependence on the weather below about 20,000 feet during flight decreased with the jet age. Apart from terminal weather, interest was confined to wind speed and direction, temperature, the existance of thunderstorm activity or high Cumulonimbus clouds on the flight path as well as the heights of the jet stream and tropopause. The preparation of flight documentation at each departure airport particularly for the long range and upper level flights was seen as wasteful. Responsibility for the preparation and distribution of upper level significant weather and computer prepared forecast wind and temperature charts, at least for long range flights was assumed by selected regional centres. Two technological advances facilitated this step:-

(1) Transmission of charts by facsimile over post office lines had become standard practice in meteorology. The system was introduced to the Irish Service in 1961.

(2) Numerical modelling had been explored in meteorology before computers were ever developed. It was not surprising that computer-produced forecast charts of upper level winds and temperatures became quite reliable in the 1970's.

Information on actual and forecast conditions at destination and departure airports and alternates, as well as special information like SIGMETs was readily available with the streamlining of communications.
Weather Radar was installed at many major airports in the 1960's. It proved very useful in identifying Cumulonimbus or active frontal type clouds which could cause problems on take-off or landing. Advances in microprocessors and digital communications have made possible the compositing of displays from different radars. A pilot project which provides a composite animated display of weather radars located in five European countries including Ireland has been operating successfully for a number of years. Although a lot of expense is involved, the system is expected to prove an invaluable aid to forecasting both terminal weather and en route weather particularly for the lower level flights.

Weather satellites were introduced in 1960, the coded messages from a ground station being disseminated. When a number of weather ships were withdrawn from the Atlantic consequent on their introduction, there were mixed views, particularly in countries such as Ireland affected by the withdrawal of the weather ships, as to their value. With a steady improvement in the technology, direct reception at an inexpensive ground station became possible, infra-red sensing provided useful pictures throughout the 24 hours and in more recent years with advances in microprocessors, receivers capable of storing, enhancing and animating the displays, became available at forecasting offices.
In 1983 ICAO and WMO jointly adopted the World Area Forecast System (WAFS). London and Washington are now responsible for independently providing global

forecasts of winds and temperature, from numerical models, the accuracy of which have greatly improved. Regional Area Forecast Centres (RAFC) prepare the Significant Weather charts (Upper Level). These charts still require human intervention as a thorough knowledge of regional climate is required. Further advances in communication and computer systems have made possible reception of TAFs, METARs, SIGMETs etc; either individually or in edited bulletin form from communications computers. Apart from its direct links with forecasting offices in Ireland the Irish Meteorological Service computer may be interrogated by public telex (90577) for these data.

With the tendency to centralise aviation forecasting, self-briefing systems are in operation at many major airports. A self-briefing unit is in operation at Dublin Airport. By simply entering the call sign of the destination airport on a keyboard a pilot can have displayed or obtain in hard copy form all routine weather information relating to the flight. An animated display of the most recent METEOSAT pictures is also provided. A similar display of weather radar pictures is also envisaged. Although not normally required the facility to contact the forecaster at the central aviation office, Shannon, is available.

Long distance passenger flights are well serviced by meteorology at present. However, more than 80% of the world's fleet of fixed-wing aircraft are one engine piston propeller aircraft. In addition helicopters are now used much more frequently in operations such as servicing oil-rigs and in urgent search and rescue operations, often associated with poor weather conditions. The helicopter is much less tolerant of ice accretion than fixed wing, asymmetric accretion and shedding on the rotor blades being the main reason. Their slower speeds make them more prone than fixed wing. Many of them are equiped with IFR navigational aids but few have sufficient protection to fly above the 0^{o} Celsius isotherm in cloud.

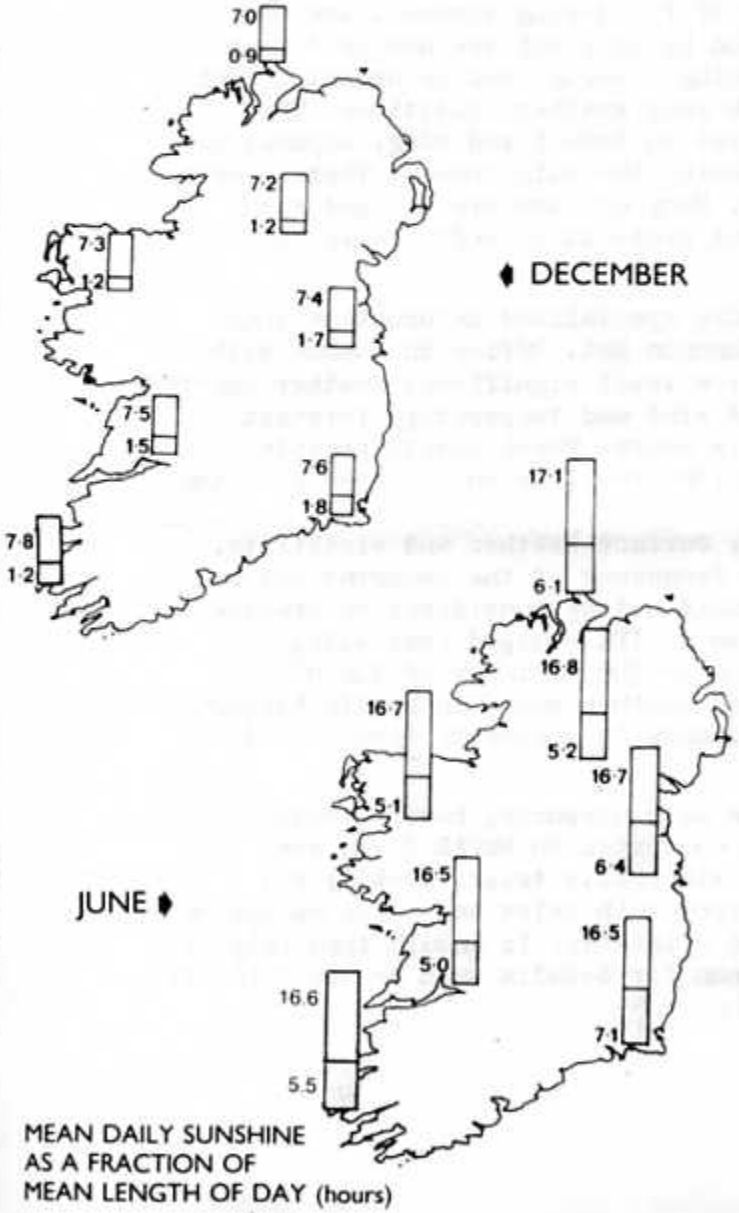
Pilots of these low level flights require more specialised information than is available for the upper level flights. Shannon Met. Office in common with central aviation offices elsewhere, issues low level significant weather charts prepared locally and, with computer prepared wind and temperature forecast charts for low levels, updates them every six hours. These charts provide very detailed forecast information up to 20,000 feet, which includes position and movement of fronts and depressions, cloud extent and type, height of $0^{o}C$ isotherm, intensity of icing and turbulence, surface weather and visibility. Due however to the insufficient density and frequency of the observations on which the charts are based the forecasts should not be considered so precise as to permit the planning of a flight such as an IFR equiped (but without full de-icing facilities) helicopter in cloud in the vicinity of the $0^{o}C$ isotherm. The installation of a new digitized weather radar in Dublin Airport together with the availability of existing radars in composite form should however improve the situation.

In addition to the TAFs, METARs etc for the main airports, hourly weather reports for twelve Irish synoptic stations, converted to METAR form, are available from the communications computer, via public telex. Ideally all flying clubs or organisations should be equiped with telex and - for reception of significant weather charts by arrangement - telefax. It should then only be necessary to contact the forecaster in Shannon for details such as the '1000 ft' wind or clarification of a marginal situation.

Sunshine in Ireland

The sunniest months are May and June. During these months sunshine duration averages between 5 and 6·5 hours per day over most of the country. The extreme southeast gets the most sunshine, averaging over 7 hours a day in early summer.

December is the dullest month with average daily sunshine ranging from about 1 hour in the north to almost 2 hours in the extreme southeast. Over the year as a whole most areas get an average of between 3·25 and 3·75 hours of sunshine each day.



MEAN DAILY SUNSHINE AS A FRACTION OF MEAN LENGTH OF DAY (hours)

Spring 1989

Sunny with average temperatures Rainfall above average in the west and north

March : ***Wet with temperatures above normal***

April : ***Generally cold, frosty and unsettled***

May : ***Dry, warm and sunny***

The mild wet weather at the beginning of spring was followed by colder, harsher conditions in April. May averages were well above normal largely because of the very high temperatures between 19th and 23rd, but at the end of the month it was again quite cool. It was the warmest spring in the past 7 or 8 years with maximum temperatures in May, breaking previous records at many stations. Mean temperatures for the season ranged from slightly below normal in the west to as much as 0.5°C above normal elsewhere, while mean maximum temperatures were up to 1°C above normal. The highest daily value was the 26.9°C recorded at Cahirciveen on 22nd May. The most noteworthy frost was in late April when a few stations had more than 4°C of airfrost.

Rainfall totals ranged from 311mm at Cahirciveen to 147mm at Dublin Airport. In the north rainfall amounts of up to 150% of normal occurred, while in the west amounts ranged from 110% to 140% of normal. Over the greater part of the midlands, east and south rainfall totals were about normal but Cork Airport and Kilkenny had less than 95% of normal.

Sunshine totals were above normal almost everywhere, ranging from 427 hours at Birr to 542 hours at Rosslare. It was the sunniest spring for between 5 and 14 years at most places and the sunniest since 1962 at Cahirciveen.