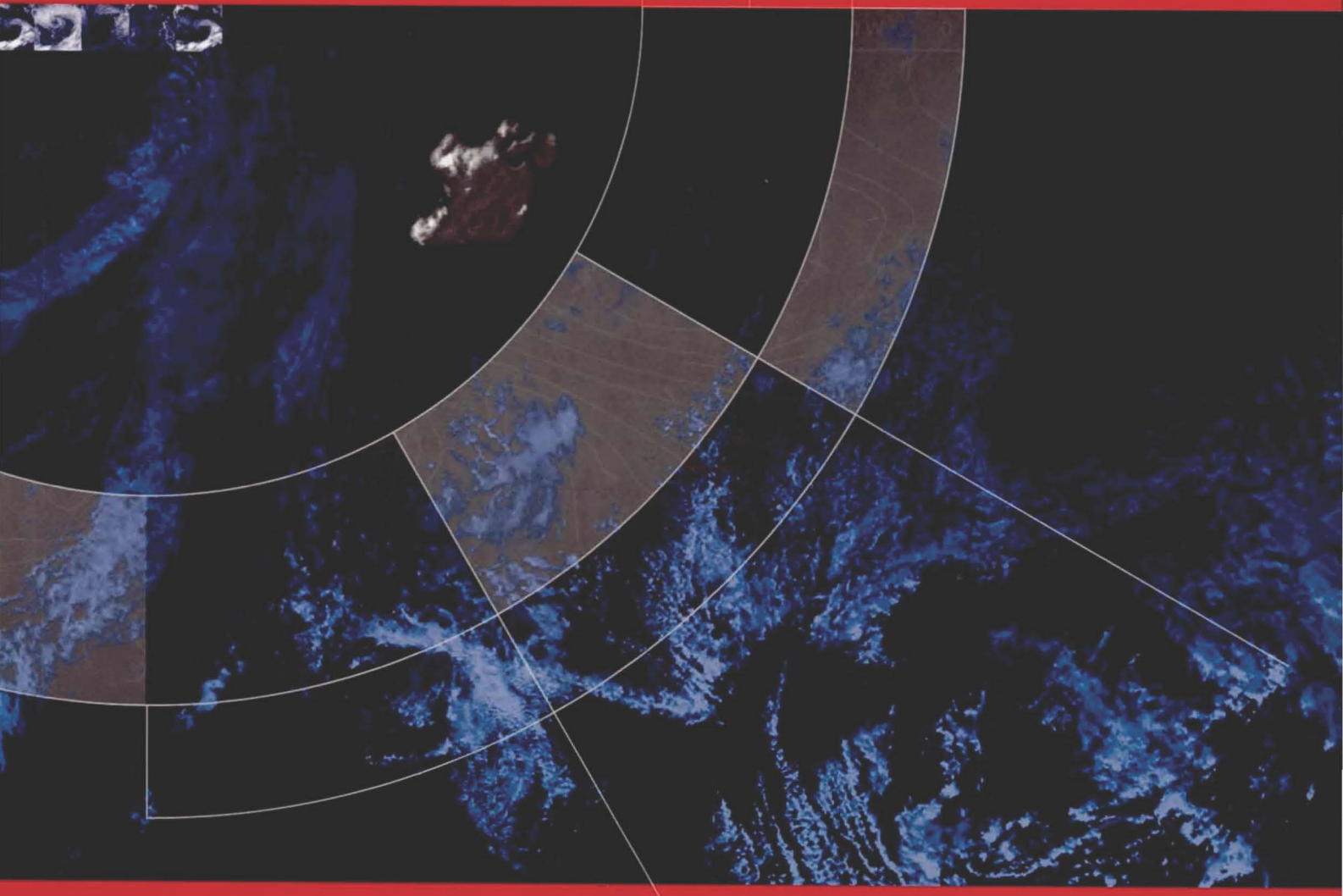
1 9 9 8

MET éireann

Met Éireann Annual Report 1998



Contents




Foreword

For an organisation such as Met Éireann which operates within the Irish Public Service, 1998 was a significant year in one particular sense in that it was the year in which the Public Service Management Act (1997) came into force. The Act lays out a new planning, accountability and review process for government departments. Its provisions include "progress reports to the Minister of the Government on the implementation of the strategy statement annually or at such intervals as the Government may by order from time to time direct".

It is in the spirit of that requirement of the Act that this Annual Report is presented.

The Corporate Planning cycle set out in the Act involves the production of Strategy Statements, Business Plans and Divisional Plans. Met Éireann contributed to the Strategy Statement published by our parent department, the Department of Public Enterprise, in April 1998. Our specialised role, however, makes it sensible to work out our own planning cycle, embedded within the Department's one, and the results of that will be available in early 1999. As the starting point for our review of progress in meeting objectives in 1998 it is pertinent to set out the high level objectives for Met Éireann contained in the Department of Public Enterprise Strategy Statement:

1. *The primary objective of Met Éireann is to ensure the availability of a comprehensive range of meteorological services. To achieve this objective, it endeavours to optimise the benefits of modern technology and maintain a well-focussed research programme. This is underpinned by effective human resource management.*

2. *As Met Éireann is providing chargeable services, it also aims to increase its contribution from commercial activities to offsetting the cost to the State of meteorological activities.*

Within this report a variety of developments and achievements are recorded which can be used to gauge progress. In particular I would like to highlight the following points as being relevant to our high level objectives:

- 1998 was a good year for forecasting in which all of the main significant weather events were well forecast. The storms occurring on St. Stephen's Day and the succeeding days caused a good deal of damage around the country but early




"1998 was a good year for forecasting in which all of the main significant weather events were well forecast."

warnings by Met Éireann enabled preventative measures to be taken and put emergency services and the ESB in a good state of readiness.

- The range of services provided to our customers was maintained and even expanded.

- To underline the important role of the meteorological infrastructure, a comprehensive technology programme was implemented. Among the main features were Automatic Weather Stations in Birr and Kilkenny, an autolauncher in Valentia Observatory and an IT replacement programme as part of our Year 2000 activity. Work on the Year 2000 problem in general had geared up considerably by the end of the year. Other IT developments included greatly enhanced facilities for Internet access and for e-mail.

- Collaboration with other institutes continued within the HIRLAM and Telflood programmes and in various jointly funded projects organised by EUMETNET.

- The implementation of the Freedom of Information Act in April meant that Met Éireann had to set up appropriate structures and to publish information to enable the public to use the provisions of the Act. The level of enquiries was low.

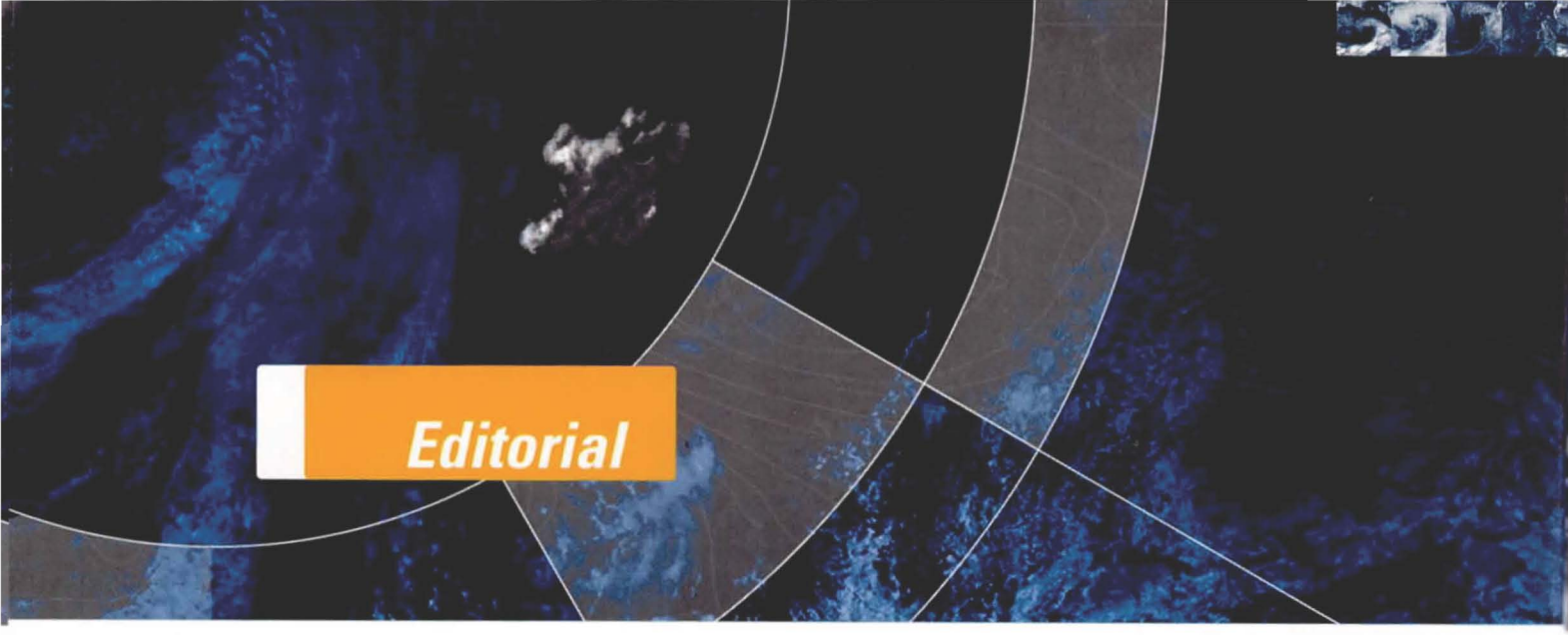
- Among the achievements in the area of human resource management were the finalisation of the Training Needs Analysis, the setting up of a Partnership Council (in accordance with the Partnership 2000 agreement) and initial training and implementation of a new Performance Management scheme for the Civil Service.

- Commercial revenue for the year was very satisfactory, exceeding £700,000 for the first time.

- The year was particularly notable for Met Éireann's achievement in winning the contracts for the provision of weather forecasts and graphics to both RTÉ (television and radio) and the new TV3 station. Both contracts were gained in competitive tendering processes.

- All in all 1998 was a busy and successful year in which the hard work and talents of our staff were much in evidence.

Declan Murphy
Director
March 1999

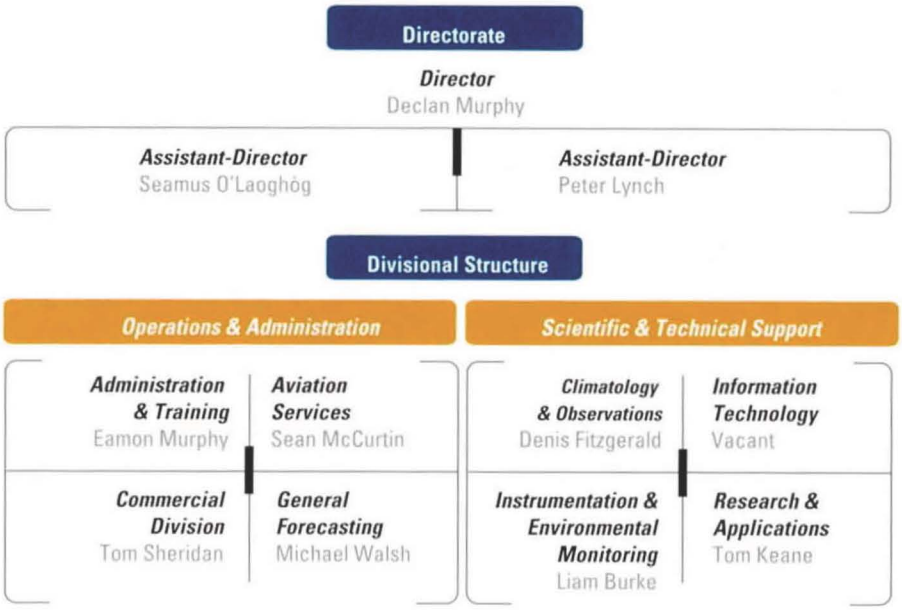


Editorial

Some of the highlights of the year, both in terms of Met Éireann activities and of weather events, are indicated in the graph / table on page 6. A major development was in the area of preparation and presentation of graphical forecasts, for TV in particular (see page 7). One of the unusual features of this project was the exceptional level of cross-Divisional co-operation involved, with Information Technology (IT), Instrumentation and Environmental Monitoring (I&EM), General Forecasting (GF) and Commercial Division (CD) all playing important roles. The acquisition and installation of a new radiosonde launcher (page 10) was another major undertaking during the year. Our three major programmes (Observation, Forecasting and Climate) are dealt with in separate articles this year. Other activities undertaken during the year which do not fit neatly within one of these programmes are separately described (page 27). Appendices I, III and IV provide a summary of publications by our staff, staff movements / training and Met Éireann finances. As promised in our Quality Customer Service Plan, Appendix II provides comprehensive accuracy scores for our aviation forecast products and one aspect of our general forecast products (temperature forecasts) as well as some indication of the accuracy of our Numerical Weather Prediction (NWP - used primarily for internal guidance) model.

Met Éireann's Annual Report is compiled and produced by Commercial Division

Structure of Met Éireann

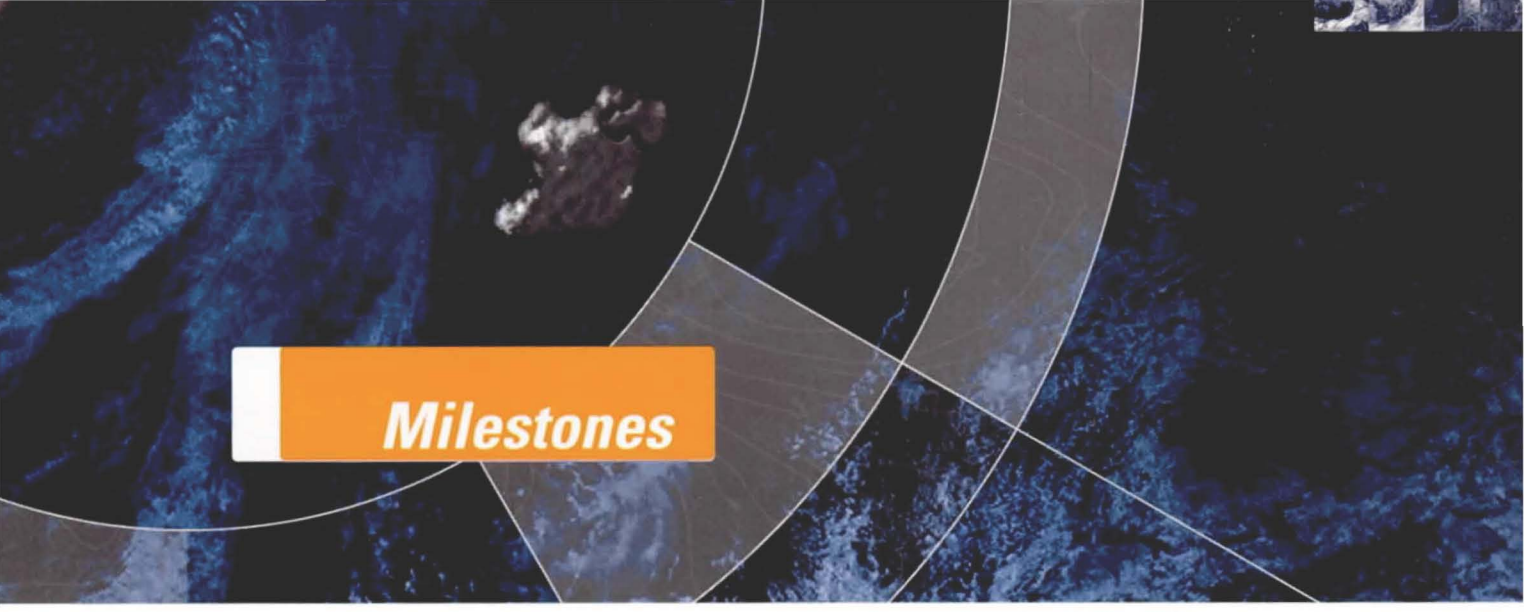


Mission Statement

Our Mission is to meet the national requirement for high-quality weather forecasts and associated services, with optimum efficiency and value for money.

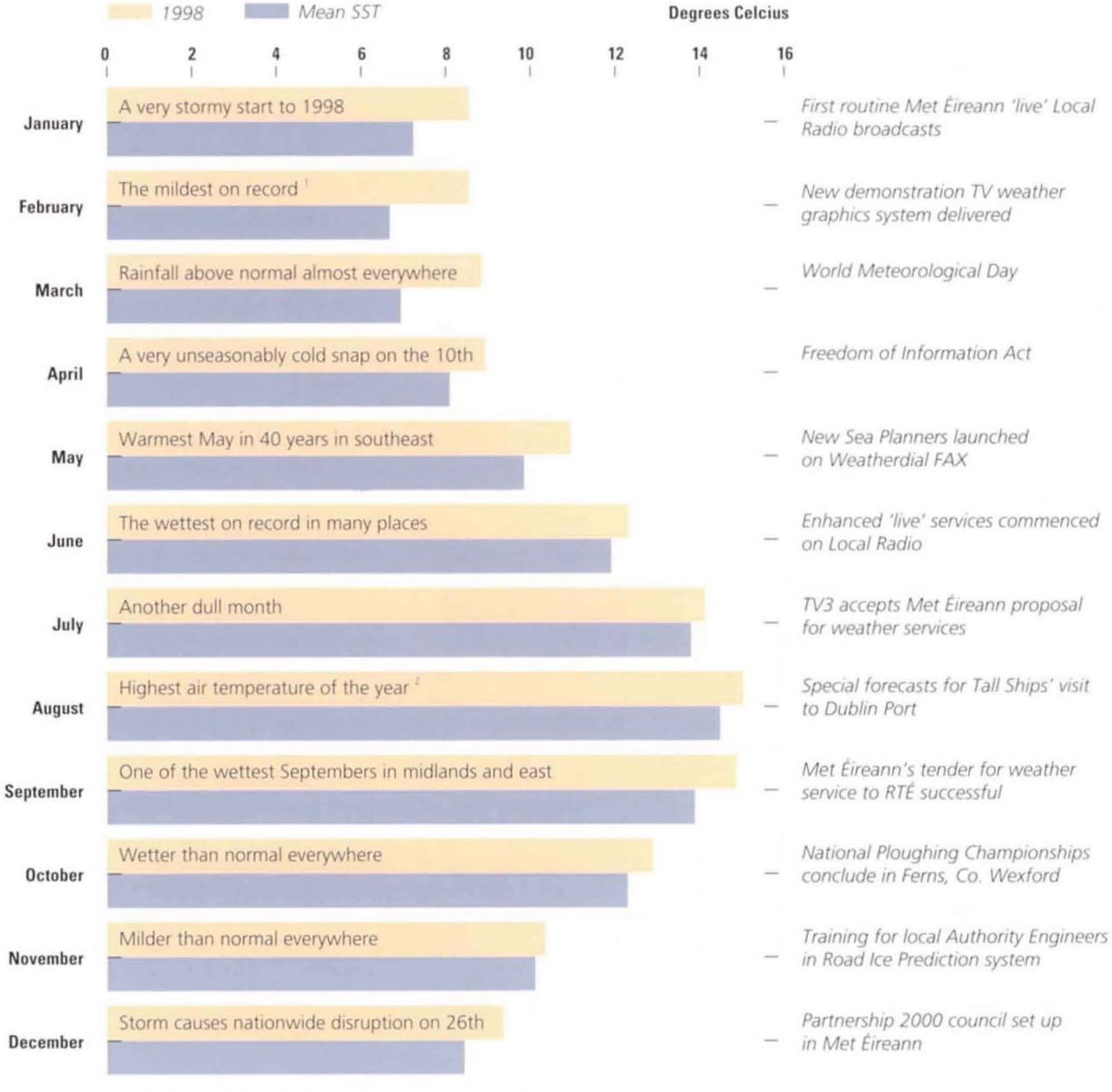
This Mission Statement implies that we, as the National Meteorological Service, will

- help to ensure the protection and safety of life and property by issuing public weather forecasts and warnings
- contribute effectively to national prosperity and to Government objectives by supplying relevant meteorological services to all sectors of the economy
- ensure customer satisfaction by continually improving the range and quality of our forecasts, the cost-effectiveness of our operations and our overall standard of service
- foster a professional and supportive work environment which attracts, retains and develops committed employees
- ensure the maintenance of a high-quality and cost-effective meteorological infrastructure, consistent with national requirements and resources
- meet the State's obligations to provide meteorological services to the aviation sector
- enhance the quality of our climatological archives and provide easy and effective access to our databases
- participate in the on-going development of meteorological science and its applications in collaboration with our European partners and with the wider international community
- contribute to the effective monitoring and good management of the natural environment.



Milestones

Mean monthly sea surface temperatures (SST) at Malin Head continued to be above average throughout the year



[1] 17.3° recorded in the Phoenix Park in Dublin on the 15th

[2] 25.3° recorded at Kilkenny and Casement Aerodrome on the 8th and 9th respectively

Articles

New Services to TV

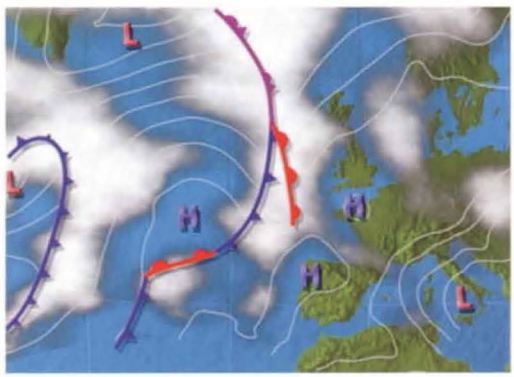
Background

Met Éireann has been preparing and presenting weather forecasts on TV since 1962. It had been obvious to us for some time that we needed an enhanced graphics preparation platform, not only for the TV area but also for preparation and dissemination of products to the print media. The proposed licensing of an independent TV station, our desire to keep the RTÉ TV business, the need for a quality Web site, the need for improved newspaper graphics and the expected advent of digital TV all pointed to the need for a new approach which would include preparing web pages and newspaper graphics on a dedicated platform and offering this platform as part of our proposals for new TV services.

Demonstration system

Over recent years we had become aware of TV weather graphics systems both through our relationship with RTÉ and during various visits abroad. The information gathering process was accelerated during 1997 with correspondence and discussions with a number of NMSs and others regarding methods of preparation of TV graphics and other graphical products for customers. Following a survey of available platforms, the decision was made to purchase a demonstration *Metacast Ultra* system.

This was purchased and installed and training provided in February. A *Metacast* Implementation Group was established and continued its work while forecasters familiarised themselves with the system. Maintenance contracts that provide for software updates and upgrades, telephone support etc. were concluded for the *Metacast Ultra*.

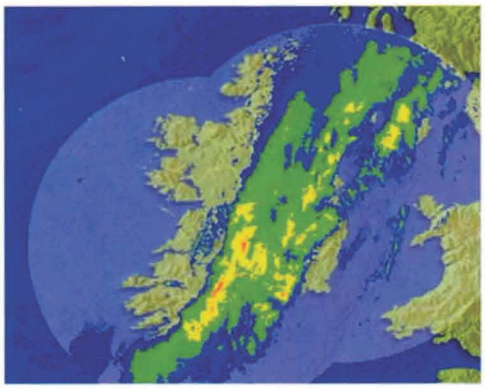


Forecast clouds, fronts and isobars

The *MetaCast Ultra* System

The system as currently configured runs on Silicon Graphics (SGI) O2 workstations with 1Gbyte RAM and 9Gbyte disks and a Unix operating system. One machine is required at the preparation end and another at the broadcast end.

The platform comes with video input/output which provides for the grabbing of live video clips, stills or images from other packages and has interfaces for almost any conceivable meteorological input source.



High resolution radar

The system is also designed with a simple and accurate macro/scripting capability, which allows fully automatic production of weather shows/presentations. It ingests the following data streams in real time: -

- Weather observations with data displayed as weather icons or contours. The icons include weather symbols, wind arrows and temperatures.
- Radar data. *Metacast Ultra* supports both composite weather radar images and higher resolution single-site images.
- Data from polar orbiting (NOAA) and geostationary (Meteosat) weather satellites. An advanced image filtering utility makes it possible to directly composite infrared, visible and water vapour (total of 3 channels) in animations or still images.
- Weather forecast data, including gridpoint fields from ECMWF and HIRLAM or any other gridded information.

The system automatically creates temperature and rainfall contours in any number of colours, transparencies and intervals. Such charts, along with all other model field-based charts, can be freely animated over time with a smooth interpolated animation. Satellite and radar images with zoom may be overlaid and composited at the same projection and animated and synchronised in time.

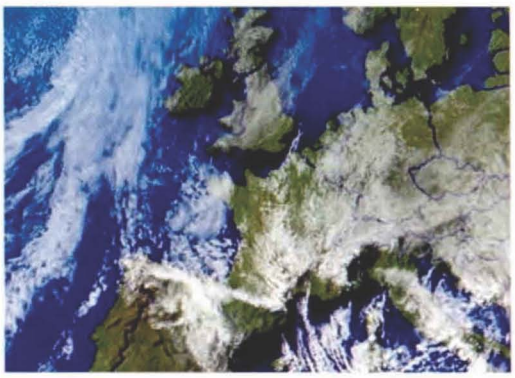
Cloudcover forecasts are generated on the basis of model data, using fractal patterns (resembling satellite imagery) or smooth grey scaled clouds. Wind is displayed as arrows or as wind contours (isotachs).

Other phenomena which may be displayed include UV index, pollen index, forest fires risk and road conditions.

All symbols and fields are based on the underlying model data. The system allows forecaster intervention to correct and adjust all model fields and symbols, their location and movement. It has a cloud dimming function that automatically adjusts the brightness of weather icons for night displays.

The front drawing tool can draw any kind of fronts, as well as upper-air jet streams and the system automatically generates intermediate time steps for a smooth animation. The system has its own fully integrated paint toolbox and poster generation tools.

Forecast temperatures over Europe



Meteosat Imagery

Since the system is highly configurable, it is very easy to have any number of different graphic designs being managed from the same computer unit.

Output from this platform is 100% broadcast quality. The 3-D module generates terrain overviews and fly-through sequences directly from the same weather data and icons, which are entered in the 2-D operational mode.

TV3

In early 1998, a meeting was held with TV3 and the system demonstrated. Following a detailed cost / benefit study a proposal was made and accepted.

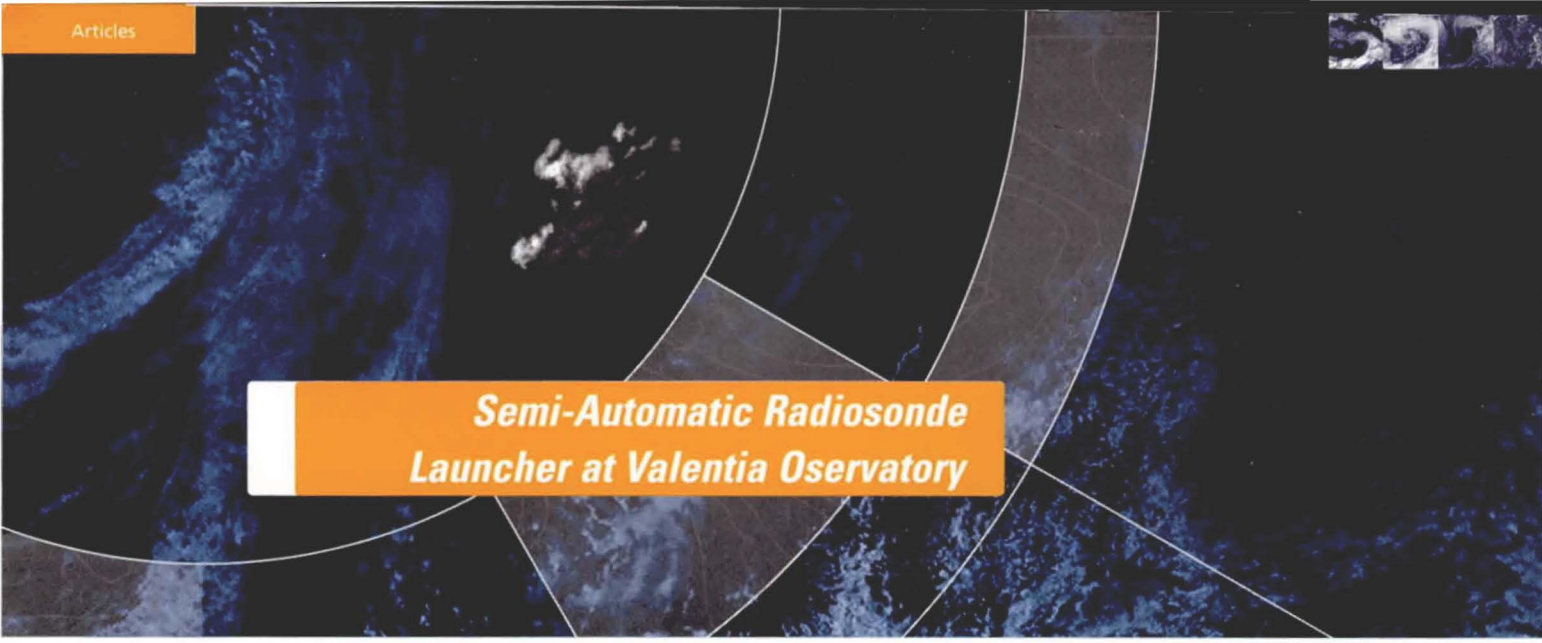
Delivery was taken of the graphics production platform on 14th September and with excellent co-operation between staff from our various Divisions, TV3 and Metaphor the system became operational in time for the station launch a week later. Forecast graphics and texts are prepared at Glasnevin and sent over a dedicated line (with ISDN backup) to TV3 twice per day for presentation on air by a TV3 presenter.

RTÉ

Following extension of our existing contract with RTÉ, they decided to issue a public Invitation To Tender. Met Éireann tendered for the provision of all four aspects (data, forecasts & graphics, presentation on air and graphics platform). The contract for parts one, two and four was awarded to us in October, subject to agreement on the detail. Some detail of the implementation (for both RTÉ TV channels and their radio services) and the procurement procedures were then finalised and an order for further SGI hardware and *Metacast* licence was issued in December. It is expected that the new system will come on air about the time of publication of this report.

Future plans

Met Éireann now has a comprehensive customer product graphics system. We are now in a position to seek business from other TV broadcasters, cable operators, newspapers etc. with the offer of attractive and flexible graphics. Additionally the system is capable of producing World Wide Web pages to a high standard. Our only constraint at this stage is a lack of staff resources in the technical and meteorological areas.



Semi-Automatic Radiosonde Launcher at Valentia Oservatory

History of radiosonde measurements at Valentia Observatory

Following the first transatlantic flights to and from Foynes in 1939 there was an increased emphasis on aviation requirements and greater demand for upper-air data by forecasters. Theodilite wind measurements, along with radiosonde measurements of pressure, temperature and humidity were introduced twice daily in September 1943 and in 1946 a radio theodolite was introduced for the upper wind observations.

The theodolite was replaced during 1948 by a radar system which was in service until 1968, when it in turn was replaced with a purpose-built wind finding radar. Four daily radiosonde and radar wind ascents were introduced in 1961. The Vaisala system arrived in 1977 and, from 1988, radiosondes using the OMEGA Navigational system were used.

Wind only ascents were discontinued from April 1993, with Vaisala sondes being used for all ascents from that date. The Loran-C Navigational System has been used for windfinding since the OMEGA system ceased in September 1997.

Uses of radiosonde data

Measurement of upper-air parameters has been for many years and still remains a very important tool for weather forecasting. Some essential uses are:

- As an input to NWP models
- For aviation forecasting of cloud height and depth, wind shear and wind speed at various heights etc.
- For general forecasting of winds, atmospheric stability, max / min temperatures and mixing height
- For atmospheric and ozone research and for dynamic and thermodynamic research

The ASAP Launcher

The decision to investigate the possibility of automating the launch system was made in January 1997. Various systems were examined with the eventual choice being the Automatic Shipboard Aerological Programme (ASAP) launcher, primarily for the following reasons:

- Despite its title, it is semi-automatic but




"Measurement of upper air parameters has been for many years and still remains a very important tool for weather forecasting."

more importantly it is suitable for balloon launching in wind speeds above 15 m/s.

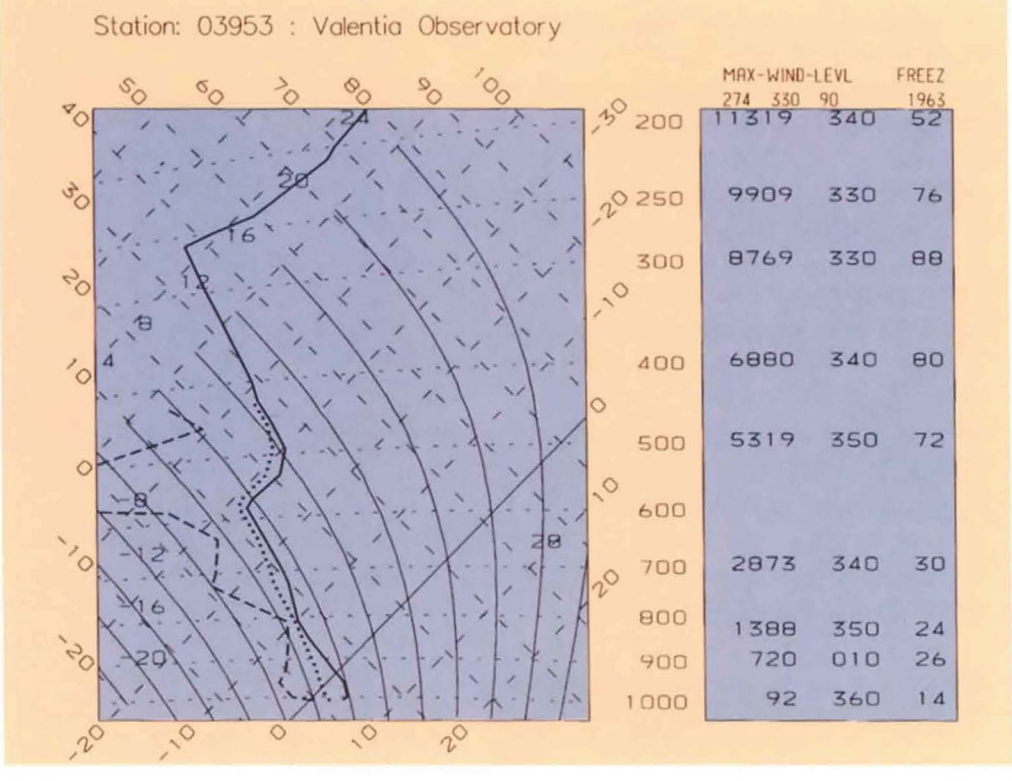
- The launcher can be rotated so that the balloon will always be launched downwind
- Being based on simple pneumatics, it is therefore more reliable and accordingly will have less 'downtime' for service
- Operation of the launcher is both simple and safe
- With the semi-automatic launcher, savings in staff costs will allow the re-introduction of the 0600UTC ascent
- A suitable location was available within the Observatory's compound

Following the decision to purchase the ASAP launcher, major construction work was undertaken at the Observatory to arrange for its installation.

How a radiosonde works

A radiosonde is a small object weighing about 200g which contains pressure, temperature and humidity sensors, a wind finding aerial and a radio transmitter to send data back to the monitoring station. The radiosonde is carried aloft by a balloon, filled with a lighter-than-air gas, which eventually bursts at an approximate height of 30km.

Valentia Observatory is widely regarded as one of the most important upper-air observing stations in Europe due, in part, to its location on the Atlantic seaboard. The introduction of the semi-automatic launcher and the 0600UTC ascent should enhance further its reputation as an important provider of high quality upper-air data to the meteorological community.



Radiosonde data as normally displayed in forecast offices

In the right panel is the height above sea level (in metres) of the observation, the wind direction (degrees) and speed (knots). The dashed / solid lines from lower left to upper right are lines of equal temperatures (labelled on bottom and right side of main graph) and the height in hPa is shown to the right of the main graph. The solid plotted line is the air temperature and the dashed plotted line is the dew point temperature. There is a stable layer at about 560 hPa and the tropopause is at about 250 hPa in the example shown.

Commercial Revenue 1986 - 1998

Met Éireann has made considerable efforts to increase its commercial revenue over the past 13 years. In this context by 'commercial revenue' we mean income which excludes that from Civil Aviation and from our parent Department. The Civil Aviation receipts come from Eurocontrol, are part of the route charges paid by civil aviation and represent essentially the recovery of the cost of providing service to that sector. Such receipts are very substantial compared to commercial revenue, normally amounting to about £4,500,000 (c. € 5.7 million) per annum.

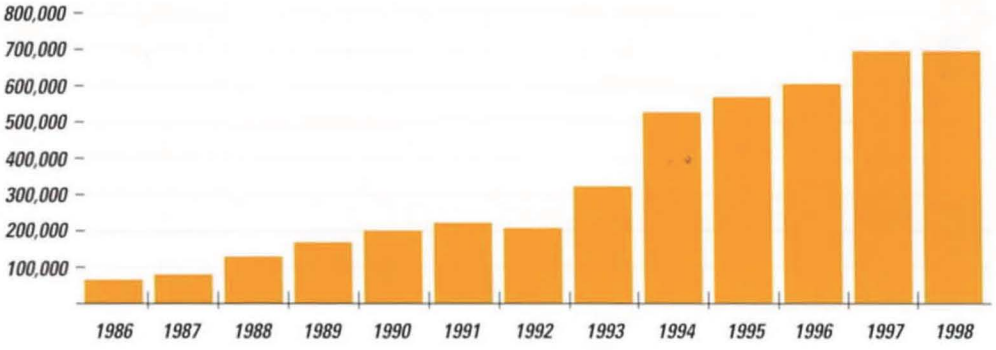
After a period of growth (albeit from a low base) from 1986 to 1991, 1992 brought the only drop in revenue in the series. This resulted from a number of causes including protracted negotiations on a new contract with our major media customer. Improved media revenue and strong growth in calls our premium rate telephone services (first introduced in late 1992) led to strong revenue growth during 1993 and 1994. Enhancement of the premium rate services (including fax services introduced in 1995) brought a more or less steady growth in revenue from this sector in subsequent years. Added to this was a growth in revenue from our climate services. 1998 brought very little revenue growth, though we were very busy in negotiating, preparing for and establishing new TV weather services. The reward for this work is expected to come in the form of a substantial increase in revenue for 1999.

In our present accounting system a Cost Centre, Market Segment and Service code is allocated to each receipt.

Market Segments

We have divided our customers into 18 major sectors, each of which is subdivided into up to 10 segments.

Our top revenue generator in recent years has been the interrogable media (primarily our Weatherdial premium rate telephone and fax). The broadcast media (national and Local Radio and TV) is the second highest revenue generator in most years (third in 1998 due to delay in some payments). Though we dedicate a substantial amount of our forecast office resources to providing services to local radio, the direct revenue from this sector is small as they all promote our premium rate services in part payment for the forecasts. Second in 1998 comes the revenue from forecasts, warning services, telephone consultancy etc. for Local Authorities and the National Roads Authority. The third highest revenue earner in 1997 (fourth in 1998) was the marine and offshore sector.



Met Éireann Commercial Revenue 1986-1998

Between them the top three account for approximately three quarters of our commercial revenue. Remaining sectors in descending 1998 revenue order are offshore and marine, commercial aviation services, manufacturing, print media, the general public, legal, insurance, utilities, construction, recreation and tourism, agri-business, retail, education, Govt. Departments and distribution.

It should be stated that there is an increasing number of products on Weatherdial FAX aimed at these specialised sectors (notably marine, agriculture and general aviation) and in the analysis presented here this revenue is allocated to the interrogable media. Approximately £14,000 Weatherdial FAX revenue in 1998 came from requests for products aimed directly at the marine sector and about £9,000 from aviation products.

In general, it is known that the agricultural sector is a major user of Weatherdial (the voice service in particular) with at least £200,000 of the Weatherdial revenue coming from the sector.

Services

Most of our commercial revenue (over 80% of total commercial revenue in 1998) comes from forecast services provided by our General Forecasting Division. In descending revenue order, this is made up of Premium Rate Services, contractual forecast services (including the Media), once-off forecast services and warning services.

Income from services and publications provided by our Climate and Observations Division (about 12% of total 1998) has shown significant increases in recent years. Revenue from services provided to general aviation by our Aviation Services Division has also been growing recently, particularly due to the introduction of aviation products on Weatherdial FAX and a system of forecaster briefing on premium rate lines. As NWP models improve there is also an increasing trend in the revenue from automatic transmission of such products to customers.

Programme News

Forecasting

Forecast Programme

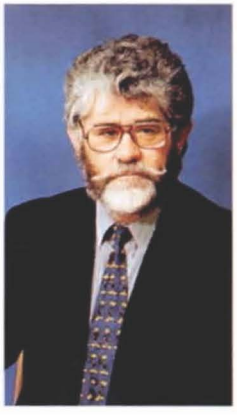
We have two Divisions (Aviation Services and General Forecasting) dedicated to delivery of the final customer product and one (Research and Applications) concerned principally with enhancement of the forecaster guidance. Having said that, our forecasting programme draws on the resources of all Divisions within our organisation.

One of the major developments which will continue in 1999 is the expansion and enhancement of our service to television - a medium which has rapidly become the preferred method of receiving forecast information for millions of our citizens. This topic is dealt with in a special article beginning on page 7.

While our HIRLAM forecast model research involvement required attendance at about 7 meetings abroad, other meetings abroad of relevance to our forecasting operations included those on TV weather graphics and presentation, road ice prediction, forecast graphics, ensemble prediction methods, seasonal forecasting, aviation forecasting, forecast office co-operation, advanced training at ECMWF Reading, a meeting on satellite intepretation (c.f. SATREP item in our 1997 report) in Helsinki, forecaster visits to Météo France in Toulouse, etc. Most such meetings with colleagues abroad are essential in our task of keeping abreast of developments in what is a rapidly changing field.

As well as our training programme, developments in IT and in the observations area, the following are some areas of research which were undertaken with a view to improving our forecasting systems during the year.

HIRLAM Research



The current three-year HIRLAM Project commenced on 1 January, 1997 and one of our Assistant Directors (Dr. Peter Lynch) is the Project Leader. Ireland is directly involved in several key research areas, essential to the future excellence of our forecasting programme.

An intensive programme of meetings and workshops was organised during the year including an All-Staff Meeting, five Management Group

meetings, a Workshop on Variational Assimilation and a series of Workshops on Clouds and Condensation, Turbulence Parameterisation and Surface Processes. Two meetings of the governing Council of HIRLAM and two meetings of the HIRLAM Advisory Committee took place during the year.

Much of the work of the Research and Applications Division is in line with the HIRLAM Project scientific plan. Examples of the research undertaken include 3-hourly data assimilation, improving time integration schemes, lateral and upper boundary conditions for operational regional forecast models, impact of filtering on orography, mass conservation in Hirlam, stretched horizontal coordinates and grid rotation, and model postprocessing and verification on regular and rotated grids. Other developments in the broader context of HIRLAM research occurred during the year. Objective verification results show clear improvements for the newer HIRLAM versions.

Changes in our NWP system

Changes to the Operational HIRLAM System resulted from a move from a 6-hour assimilation cycle to a 3-hour one for operational NWP forecasting. Advantages to be gained from a 3-hour cycle include reduced phase errors due to large differences between analysis and observation times and more data (especially satellite and aircraft data) being assimilated. More frequent assimilation and use of fresher boundary values in the HIRLAM model have been shown to benefit model runs. A shorter assimilation cycle can also exploit the availability of 3-hour boundary files from ECMWF. Better rainfall forecasts and reduced geopotential errors resulted from the changes.

Some inadequacy in the HIRLAM model 2m temperature forecasts means considerable forecaster intervention is necessary to modify the NWP outputs before input to the road ice prediction model. An investigation of the application of a Kalman filter in the elimination of bias from HIRLAM 2m temperature forecasts was carried out. Investigation has shown that 1-parameter Kalman filtering is adequate and results with a 2-parameter filter are not encouraging. Further investigation of techniques is ongoing.

Numerical Weather Prediction (NWP)

NWP computer models are by far the most important tools of the forecaster. We are part of the European Centre for Medium-range Weather Forecasting (ECMWF - an organisation of 18 European NMSs with centralised research, development and operations located in Reading, UK). Its forecast products - extending to 10 days ahead - are received by Met Éireann twice per day. It consistently produces the highest quality guidance available anywhere in the world. HIRLAM, on the other hand, is a distributed NWP R&D project with 8 member country NMSs. Our researchers are intimately involved in the development of the HIRLAM model and we run an operational version of the model in Ireland as our principle source of forecast guidance out to 48 hours ahead. Our forecasters also have access to the UK and German NWP output.

Forecaster Workstations

In order to make the best use of the huge amount of NWP output and other information available, forecast offices need sophisticated systems to display and manipulate the information. Our Research and Applications Division has developed a system known as XCHARTS running on SGI workstations and PCs which permits forecasters to view and manipulate NWP, satellite and other data. The software allows overplotting, differencing, looping, zooming etc. During the year

the system was enhanced by the inclusion of the facility to display satellite images superimposed with multiple overlays of various special NWP output fields and the inclusion of SATREP analyses. Various products are calculated and displayed as meteograms of sea, swell and wind conditions at desired locations off the coast of Ireland. The system to display and modify various NWP outputs required for road ice prediction was further enhanced during the year.

General Forecasting

While our forecast performance throughout the year can be measured by various accuracy figures and skill scores (see Appendix), it is by individual successes or (more likely) our occasional catastrophic failures that our customers (including the general public) judge us. We are pleased to report that there were no major forecast failures in 1998 and some notable successes (for example the very damaging Stephen's Day storm, which was signalled well in advance).

For some years it was apparent that General Forecasting Division (GFD) was close to saturation in terms of workload. Due to the workload in IT and R&A Divisions (including work related to the Year 2000 problem), it was not possible to pursue major streamlining or forecasting techniques development initiatives. However, during the year a number of measures were undertaken by individuals within the GFD itself to ameliorate the situation - for example, programs were written to extract forecast information already produced and to format it to suit customer needs. Some changes in the Weatherdial system were introduced to ease the GFD workload involved in updating products.

Our Telephone Consultancy forecast Service (TCS) again proved very popular with subscribers including (amongst others) pigeon racers, greyhound racing stadia, utility companies, a salmon farm and agri-businesses. Film companies remain the major users of this service with the forecast being availed of by more than 22 companies during the year. Charges for this service were restructured during the year and contract customers now purchase their consultations with the meteorologist in blocks of ten calls.

Tailored forecasts were provided for many major events in the country in 1998. These included the Tall Ships race, the Tour de France Irish stages, Dublin's St. Patrick's festival, the arrival of the QEII, five Mirror Class competitions etc. Apart from these, we provided tailored marine forecasts for various locations to the offshore oil and gas industry and cable laying between UK and Ireland.

Our service to the ESB was enhanced during the year. Early in the year we began issuing warnings for the Lee catchment and later in the year a comprehensive service including warnings, telephone consultancies and (in certain situations) provision of hourly reports from our stations was put in place for their distribution division.
A number of other additional customers were signed up for warning services during the year for such things as strong wind (e.g. for funfairs) and frost (e.g. for arboriculture).

In May we restarted our sunburn warning service (approximately one day in three brought a high risk forecast for somewhere in the country during the season). Another aspect of biometeorology is the pollen forecast and we began providing this in June.

The road ice prediction service ended for the 1997 / 98 season in March. Following the installation of many more roadside automatic stations (and extra telephone lines to cope with polling the stations hourly and permitting access from an increased number of Local Authorities), the service was started up again in early November. The increased workload required an extra meteorologist to be drafted in for the season. An added advantage of having one person dedicated to the task for much of the time is that the quality of the output is higher than previous seasons.

New means of forecast dissemination introduced during the year included the provision of the output of our wave prediction model to a private company who have developed a system to permit interactive access to graphical display of the information. This system is on trial with a number of customers at year's end. We also provided forecasts to an Internet Service Provider for display on their Web page. This is the first instance of the (officially sanctioned) appearance of our products on the Web.

Services to Radio

During the year the number of Local and Community radio stations served by us increased to 27. They were supplied with approximately 25,000 text forecasts. A new format, including live broadcasts, was introduced for Dublin's 98FM and an afternoon live broadcast was introduced for Clare FM. Other changes introduced included the provision of a sea area forecast for the local coasts for a community radio station. Another first

was the syndication of a sponsored farming forecast to a number of stations over a twelve-week period. While one radio station ceased taking our forecasts, South East Radio began taking services from us during the year.

Aviation Forecasting

The importance of the aviation sector on safety, security and economic grounds is well recognised by Met Éireann. The human and other resources at our offices at the Central Aviation Office (CAO) in Shannon, at Dublin, Cork and Connaught Airports and Casement Aerodrome are dedicated almost exclusively to supporting this sector. Of course this also implies a considerable level of support from Divisions other than the Aviation Services Division.

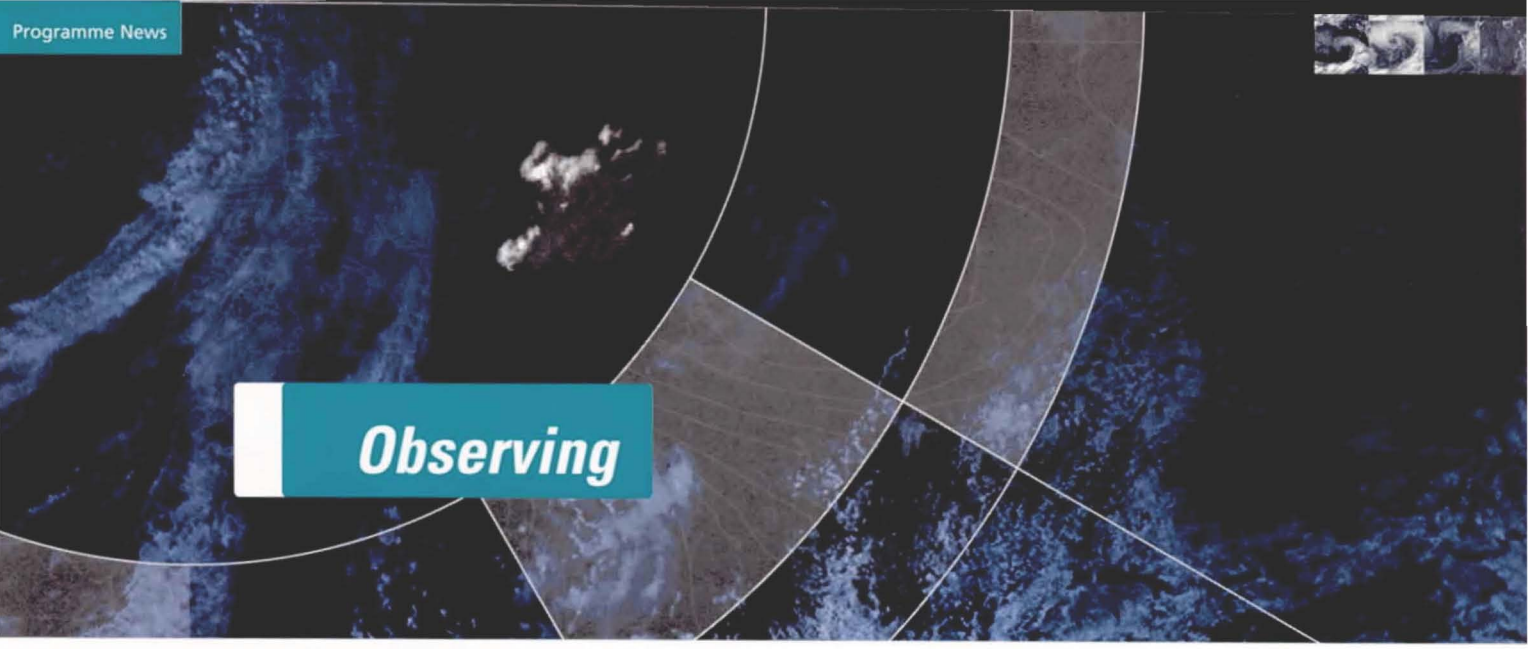
Our main customer segment in the aviation sector is Civil Aviation. Other segments include the Air Corps, General Aviation and a variety of aviation related leisure pursuits (gliding/soaring, ballooning etc.). To a large degree, civil aviation pays for our resources devoted to this sector. However, revenue from general aviation has been increasing since our recent introduction of premium rate services for personal requests for Opmet data and briefings (7,500 in 1998) and by the inclusion of aviation texts and charts on our automatic Weatherdial Fax service.

The following approximate figures give some indication of the output of the Aviation Services Division during the year:

- 92 SIGMET warnings for Irish airspace
- 60,000 METARs (aviation weather reports including two-hour TREND forecasts)
- 608 Local and Wind shear warnings were issued for aviation (102 for Shannon, 172 for Dublin, 78 for Cork, 89 for Connaught, 144 for Casement, 59 for Finner, 29 for Monaghan and 79 for Gormanstown)
- 13,700 TAFs were issued for the four Civil Airports and others for Casement and Gormanstown
- Local Area Forecasts (LAFs) were provided to the regional airports at Galway, Waterford, Kerry, Sligo and Donegal on a routine basis
- 10,300 flight folders
- 5,500 individual fax transmissions
- 470,000 (or almost one per minute around the clock!) Self Briefing Unit sheets of data

Search and Rescue operations were provided with routine meteorological support services throughout the year and with special services as required. Additionally, crew training (mainly at Shannon) by 11 airlines was supported.

Technical developments within this area included replacement of the AFTN communications system at Shannon (almost complete at year's end); a new satellite display system and a SIGMET entry and quality assurance checking system for the CAO were developed and became operational; IT Division arranged for volcanic ash advisories to be routed to the CAO. In Dublin Airport a considerable amount of work related to the Y2K problem was completed and a new Opmet request / reply system were introduced late in the year. Windows-based integrated weather display systems (for ATC and SBU) were introduced in Dublin and Cork.



Observing

Observing Programme

Observations are the lifeblood of meteorology. They are the foundation of climatology and of weather forecasting (whether subjective or automatic). Two broad classes of observation are distinguished - in-situ measured and remotely sensed. Amongst the former are observations from our synoptic stations (both manned and automatic), from climate stations, from ships' observers, from our radiosondes etc. Remotely sensed observations include data from weather radar and weather satellites.

Synoptic stations

Two further Automatic Weather Stations (AWS), at Birr and Kilkenny, were commissioned in June. All site works and staff training were carried out by Met Éireann staff. In general the network of nine AWSs is operating satisfactorily but some defects are still outstanding. The ongoing testing and field trips associated with eliminating these defects have taken up considerable resources in several divisions. The continuing automation of the synoptic network has added considerably to the task of quality control and has meant that weather elements such as visibility and cloudcover and certain phenomena, such as thunderstorms, are incomplete. However, this trend towards automation will continue.

Airports

In addition to the synoptic reports, airport observers make special observations (METARs) for aviation use at half-hourly or more frequent intervals. Such reports include mean wind and direction, gusts, visibility, weather, cloud amounts and bases, temperatures, dewpoints etc. Our observers at Dublin, Cork and Shannon Airports produced approximately 50,000 METARs and these were distributed to airports and weather forecast offices throughout Europe and beyond.




"Measurements of temperature, humidity and wind at the upper levels of the atmosphere have always been an essential input to forecast systems"

Climate and Rainfall Reports

Regular reports were received from some eighty climatological stations and six hundred rainfall stations. Six climatological stations were closed and four opened while twenty rainfall stations were closed and twenty others opened. Automation of the climatological network is an important task for the future.

Radiosondes

Measurements of temperature, humidity and wind at the upper levels of the atmosphere have always been an essential input to forecast systems. This importance has increased with increasing reliance on NWP. Our one radiosonde station (at Valentia Observatory) achieved 1,100 ascents during the year. A major upgrade of the radiosonde ground facilities was carried out (see page 10).

Ozonesondes

Valentia Observatory was a participant in the Third European Stratospheric Ozone Experiment in the winter of 1998/1999. The Department of the Environment and Local Government funded the purchase of ozonesondes and a ground-level ozone monitor, linked to the Environmental Protection Agency network.

RADAR

Observations from our weather radars are produced at 15 minute intervals, during which time a complete atmospheric volume scan is obtained. Quantitative estimates of rate of rainfall can be obtained at a range of up to about 100km from

the sites (at Dublin and Shannon Airports). They have a useful (though non-quantitative) range of up to about 240km, and active precipitation areas out to about 400km can be detected. The are extremely useful at both our forecast offices, especially for nowcasting and very short range forecasting. Output from our radars are further processed so that users can estimate precipitation rates, tops of the precipitation and can examine horizontal 'slices' at any desired elevation. Additionally the two radar outputs are combined to form an Irish composite radar picture and they are sent to the UK Met Office where they are composited with their own radar images.

Satellite

As members of EUMETSAT, we have full access to data from Meteosat, the European geostationary weather satellite. Our forecasters thus have a continuous stream of half-hourly images covering the hemisphere centred on the equator at the Greenwich meridian. Each set consists of a visible channel (resolution 2.5km subsatellite), a thermal infrared and a water vapour (5km resolution for both) channel image. In view of their Atlantic coverage, such images are an essential input to our forecasting systems. Additional products are derived from the satellite data at EUMETSAT HQ in Darmstadt, Germany and distributed worldwide.

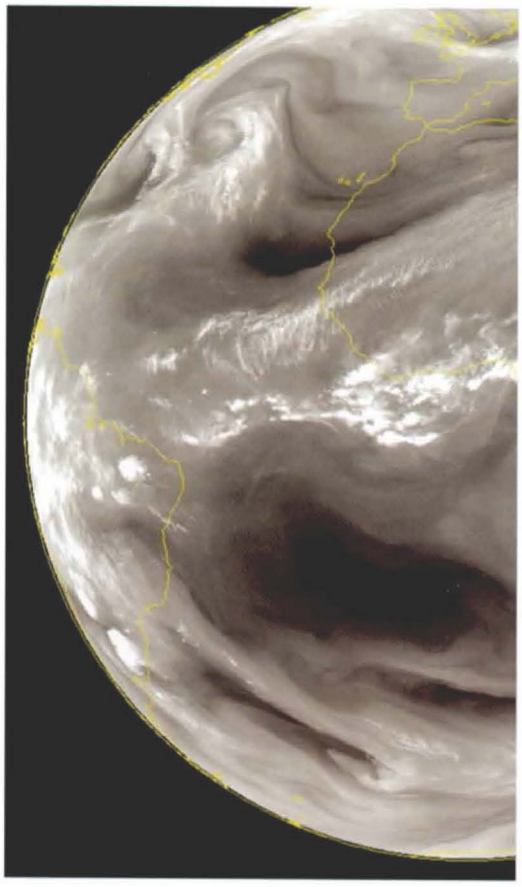
Ships' Observations

Observations from Voluntary Observing Ships are an extremely valuable source of information for meteorological operations. During the year our Port Meteorological Officers paid visits to such ships to advise the on-board observers and check / calibrate the ships' instrumentation.

Other Observations

Agreement was reached between Met Éireann and the Dublin Institute of Advanced Studies on a joint project to replace the analogue seismological system, formerly part of the World-wide Standard Seismograph Network, with a digital system.

"Observations are the lifeblood of meteorology. They are the foundation of climatology and of weather forecasting"



Environmental Monitoring

The routine monitoring of atmospheric and precipitation chemistry at many synoptic stations continued throughout the year. A review of the procedures and equipment at many of these stations was carried out. However the chemical analysis of the samples in the HQ laboratory has fallen behind, because of on-going problems with the Ion Chromatograph. Progress was made on the preprocessing of historical chemical data.

In a special project, ammonia monitors have been installed at Met Éireann stations by the Forest Ecosystem Research Group, UCD.

The routine monitoring of radioactivity in air and precipitation samples at our stations for the Radiological Protection Institute of Ireland continued. UV was measured at Mace Head Observatory (NUI, Galway) and at two Met Éireann stations, and ozone monitoring continued at Valentia Observatory.

Staff attended conferences and workshops abroad on meteorological instruments and methods of observations, radar networking, ozone and UV monitoring, quality assurance in laboratory analysis, etc. Met Éireann participated in the planning by European NMSs of a Composite Observing System.

Ongoing instrument calibration / maintenance.

A system for the checking, testing and calibration of temperature sensors was installed and became operational. The basic work of procurement, calibration, maintenance and repair of sensors and systems continued. All types of units and systems were checked for Y2K compliance and some upgrading of systems was required.

Climate Programme

Climate Database Section

The Climate web site was further developed and is now an operational tool for the provision of several types of data. This will continue to be the preferred method of delivery for new applications or services where possible. Although this is internal to Met Éireann at present, moving to external access, should the opportunity arise, would not be a major task.

An Invitation to Tender for a new Application Server was issued in late 1998. This, in conjunction with the installation of new PCs, will replace the old Unix workstations (in use since 1991). This completes a large element of the Year 2000 compliance plan for the Climate Database.

Work is about half-completed on new methods of processing and quality control for data from Met Éireann stations. The completion of this task accounts for most of the remaining Year 2000 work.

Observations Section

The policy of visiting most, if not all, of the rainfall and climatological stations every two years has certainly paid dividends. The returns from the network have been improved, as unsatisfactory stations are closed and new ones opened. Continuing automation of the synoptic network has added considerably to the task of quality control and has meant that weather elements such as visibility and cloud cover and certain phenomena, such as thunderstorms, are incomplete.

Enquiries section

There were 1,460 requests for climatological data or reports and roughly 4,500 telephone enquiries. The total amount invoiced was about 12% below 1997: this was not unexpected because that year was marked by a uniquely high level of demand for data from the wind-energy sector. Fees for court attendance have also dwindled as a result of staff shortages. There was a substantial increase in the number of enquiries from the Gardai and it would seem that it has become standard practice for them to seek a weather report for the times of serious crimes; these reports are currently provided free of charge.

The Weather of 1998

Mild and wet; dull except in south

Mean air temperatures for the year of between 8.9°C at Connaught Airport and 11.3°C at both Valentia Observatory and Shannon Airport were around a degree higher than normal, continuing a succession of warmer than normal years since 1994. Mean minima of between 6.5°C and 8.5°C generally were particularly high, the highest for over 40 years in some places. April was the only month that was cooler than normal everywhere, while mean temperatures were well above normal in March, May, September and particularly February, which was the mildest on record. Severe frost on April 10th caused significant damage to early crops in the eastern half of the country; the lowest air temperature of the year, -5.5°C, was recorded on this unusually late date at Casement Aerodrome. Birr measured the lowest grass minimum temperature, -12.2°C on 20 January. After a summer of few very warm days, the highest air temperature of the year was also recorded unusually late in the year when Belmullet measured 25.4°C on 21 September.

Rainfall totals for the year of between 822mm at Casement Aerodrome and 1782mm at Valentia Observatory were above normal everywhere, with percentage of normal values varying between 109% at Rosslare and 127% at Valentia. Clones had its highest total in almost 50 years of record, while at Birr and Mullingar it was the wettest for between 33 and 38 years. April, June and October were the wettest months relative to normal while February and May were the driest. Cork Airport measured the highest daily fall of the year, 75.8mm on 31 August.

Percentage of normal sunshine for the year ranged from 82% at Birr to 101% at Cork Airport. At most stations, annual sunshine totals have been below normal throughout the 1990s with the exception of 1995. February and March were particularly dull, while October was the only month with above normal sunshine everywhere. The highest daily sunshine, 15.6 hours, was recorded at Malin Head on June 15th. Mean windspeeds for the year were above normal generally, the highest for between 8 and 10 years in places. Winds of over 90 knots were recorded in the north and northwest on 26 December; Malin Head recorded the highest gust of the year and its highest gust for 37 years on this day, 96 knots (111 m.p.h.).

- ***Very mild during the first 3 months of the year; mildest February on record***
- ***Severe air and ground frost in the eastern half of the country on April 10th***
- ***Dull, wet summer but temperatures near normal***
- ***Wettest autumn for around 15 years in most places***
- ***Severe storm on 26 December caused widespread disruption in Northwest***

The Weather of 1998 cont.




County/Station	RAINFALL (mm)				TEMPERATURE (°C)				SUNSHINE (Hours)				SUNSHINE (Hours)						
	Total	% of Average	Most in a day amount	Most in a day date	Mean	diff. from Avg.	Extremes Highest	Extremes Lowest	Daily Mean	% of Average	Most in a day amount	Most in a day date(s)	Rain	Snow	Air Frost	Hail	Thunder	Fog	Gale Gusts
CO. CLARE																			
SHANNON AIRPORT	1144.5	125	27.7	25 Sep	11.4	+1.3	24.9	-2.3	3.38	93	14.9	11 Jun	250	3	10	20	6	28	62
CO. CORK																			
CORK AIRPORT	1378.4	112	75.8	31 Aug	10.5	+1.0	23.6	-2.3	3.97	101	15.4	15 Jun	242	7	10	14	5	88	83
CO. DONEGAL																			
MALIN HEAD	1285.2	123	31.8	2 Nov	10.1	+0.7	23.4	-3.5	3.21	91	15.6	15 Jun	274	16	8	45	5	5	201
CO. DUBLIN																			
DUBLIN AIRPORT	832.4	-	32.8	30 Sep	10.1	-	24.1	-4.8	3.73	93	15.1	15 Jun	262	13	29	11	6	28	84
CASEMENT AERODROME	822.0	113	47.8	30 Sep	10.2	+0.9	25.3	-5.5	2.39	86	14.8	19 May	223	14	25	10	6	21	116
CO. KERRY																			
VALENTIA OBSERVATORY	1782.3	127	41.5	2 Aug	11.4	+0.9	23.8	-2.6	3.49	95	12.8	19 May	289	3	7	21	7	2	109
CO. KILKENNY																			
KILKENNY	977.8	118	36.2	29 Dec	10.5	+1.1	25.3	-4.7	3.17	85	15.1	14 Jun	236	3	34	11	6	18	56
CO. MAYO																			
BELMULLET	1334.9	121	30.7	20 Oct	11.0	+1.1	25.4	-2.9	2.99	-	15.0	15 Jun	287	11	7	43	4	14	164
CONNAUGHT AIRPORT	1422.7	-	41.5	19 Jul	8.8	-	22.8	-3.7	2.94	83	13.5	17 May	307	27	25	19	1	143	79
CO. OFFALY																			
BIRR	980.0	123	31.0	6 Jun	10.3	+0.1	24.2	-5.4	3.40	93	14.5	19 May	248	7	26	10	2	11	37
CO. WESTMEATH																			
MULLINGAR II	1079.9	118	30.9	6 Jun	10.0	+1.3	23.8	-4.0	4.26	95	14.7	19 May	277	14	28	9	4	20	25
CO. WEXFORD																			
ROSSLARE	985.1	111	38.0	3 Mar	11.1	+0.9	22.7	-0.1	4.26	95	14.7	19 May	205	1	1	7	6	35	102

Other Activities 1998

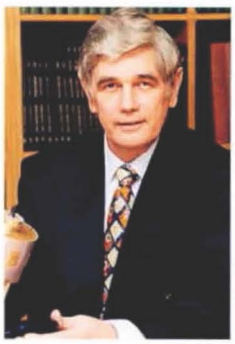
Administration

Our total expenditure figure was within the approved allocation leaving an amount to be brought forward to 1999. The underspend was mainly in the capital subheads area and resulted from the fact that some of the larger projects planned for 1998 did not progress as much as expected, mainly due to the shortage of personnel in these areas. As in 1997, the financial resources available restricted our ability to recruit.

The replacement of the fencing around the station at Roche's Point, damaged in the Christmas storm last year was completed by March. Some minor refurbishment work was carried out in HQ during the year. A major programme to replace most of the doors in HQ commenced in November. It is hoped that a much needed and long overdue a refurbishment programme at Dublin Airport will commence in early 1999. Accommodation at the other State airports was also under review prior to the handover of responsibility/ownership from the State to Aer Rianta on 1 January 1999.

Major refurbishment work on the roadside building at Valentia Observatory in Caherciveen commenced in September and was near completion in December.

Seamus O'Laoghóg, former Head of our IT Division, was promoted to Assistant Director (Operations and Administration) replacing Brendan McWilliams, who took a career break to take up the prestigious post of Head of Administration in EUMETSAT.



Brendan McWilliams

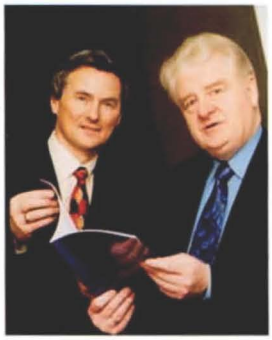
Seamus O'Laoghóg

Public Relations

Met Éireann attended the National Ploughing Championships in Ferns, Co Wexford. This is a major forum where we meet with and obtain feedback from the agricultural community. We had a range of items on display including a live connection to the Climate Database. Staff from Rosslare, Kilkenny, General Forecasting Division and HQ attended during the three days.

A Press Release to mark World Meteorological

Day (theme: "Weather, Oceans and Human Activity") was issued. We were visited by Minister of State Joe Jacob and the opportunity was taken to present him with our 1997 Annual Report.



Director Declan Murphy and Minister Joe Jacob, T.D.

On 26 March we issued a Press Release regarding Seasonal forecasts. While we are keeping a close watch on developments in this area, skill in such forecasts over Europe is not considered sufficient to warrant general release.

Globe Earth Day (22 April) was celebrated by hosting a visit (on request from the American Ambassador) from about 100 students and teachers. Globe (Global Learning and Observations to Benefit the Environment) is a programme which involves students in making weather and environmental observations, exchanging them with each other and transmitting them on the Internet to Globe's web site.

We provided input to training seminars on road ice prediction for members of the Local Authorities organised by the National Roads Authority and we attended (with the NRA) the Highways and Traffic Management Exhibition in Dublin during November. Occasional presentations on RTÉ's Seascapes and other programs commenced during the year.

As part of the ongoing promotion of Weatherdial, trophies were presented at five dinghy-racing competitions during the summer period.




Numerous school groups visited the CAO and other offices and some student work experience was accommodated. In addition to participation in meteorological conferences etc., our staff presented numerous talks to interested bodies including engineers, teachers and agriculturalists on topics including forecasting, careers, Global Warming, El Niño, the Ozone problem etc.

Informal Conference of Western European Directors of Meteorological Services (ICWED)

The Conference was concerned with difficulties arising from a plan of the U.S. National Weather Service to place all international meteorological data on an open Internet site. European NMSs strongly opposed this as it ignored the conditions attaching to some categories of data. As Chairman of ICWED for 1998 / 99, the Director of Met Éireann played a leading role in negotiations which led to a compromise whereby the data were placed on an Internet site and subject to stringent security measures.

Other Organisations

Met Éireann staff are members of numerous scientific and other committees and hold posts on many such committees including Scientific Advisory Committee of ECMWF (Chairman), HIRLAM (Council Chairman and Project Leader), Irish National Committee for Geodesy and Geophysics (Secretary), National Correspondent for the International Association for Meteorology and Atmospheric Sciences (IAMAS) and Irish Representative on the European Network on Short-range Numerical Weather Prediction Research (SRNWP)

The Training Needs Analysis Project

This project began in September 1997 and the Final Report was submitted to management in May. In embarking on this, Met Éireann was reflecting the heightened awareness throughout the Civil Service of the importance of staff training and development. Met Éireann engaged an external firm of consultants to direct the project. A highly participative approach was adopted: there was extensive consultation throughout the organisation, including a survey questionnaire which was issued to all personnel. As a result, the Final Report reflects the views of an extremely wide cross-section of staff.
Following its adoption by the Management Committee, the Report was circulated to all staff, along with an outline Implementation Plan. The challenge for the coming years will be to deliver this plan in a manner which results in tangible benefits for the organisation and individual staff members.

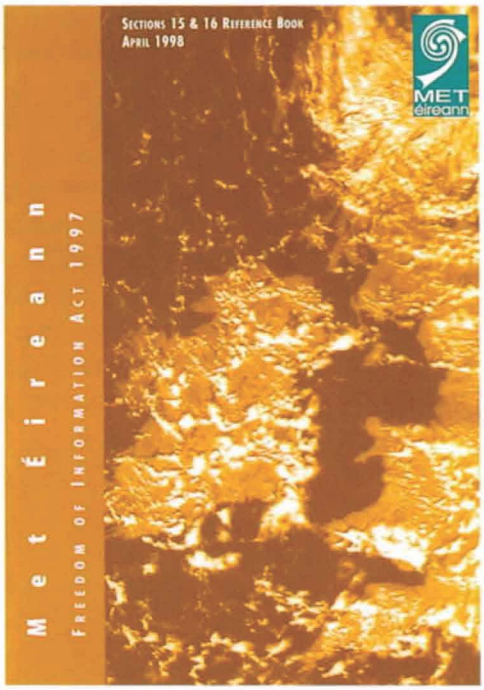
Partnership Committee

Partnership 2000 advocates the achievement of change leading to the modernisation of the Public Service based on a partnership approach. Agreed partnership structures were implemented in Met Éireann through the establishment of a Partnership Council late in the year. Its goal is to involve management, unions and staff at all levels in an open, co-operative process based on effective consultation and participation by all concerned. Among the broad range of topics that the Council may consider are training and development matters, new forms of work organisation and equality issues.

Freedom of Information Act (FoI)

The Act came into force on 21 April. While Met Éireann is a Division of the Department of Public Enterprise, some of its arrangements for administering the Act are separate from those of the Department. Met Éireann has published its own Section 15 and 16 documents and has its own decision-makers and Internal Review Board.

Any request to Met Éireann for information under the FoI Act should be sent to the Freedom of Information Officer.



Telflood Research

Met Éireann in association with the Centre for Water Research (CWRR) in UCD and partners from the Swedish Meteorological and Hydrological Institute (SMHI) and the University of Bologna, Italy took part in an EU research project entitled Telflood.

The proposed flood warning system consists of HIRLAM together with a hydrological catchment model and a hydraulic channel network model, each of which already existed separately. Met Éireann conducted experiments with nested versions of the HIRLAM model with grid resolutions varying from 55km to 5 km. The results show that, with improved resolution, orographically forced rainfall predictions are better positioned and of the right magnitude. A trigger mechanism to call the nested system from the operational system whenever threshold rainfall amounts are exceeded in the operational model is envisaged as a future refinement.

Performance Management System

Within the context of the overall Strategic Management Initiative, the implementation of an effective performance management system is regarded as a key factor in delivering improved customer services. To prepare for the introduction of such a scheme in Met Éireann, many staff participated in a customised training programme covering such areas as goal setting, coaching, monitoring and performance evaluation. This training programme will continue in 1999.

Appendicies

Publications

Internal Memorandum

Sheridan, Tom, 1998. An Investigation into Met Éireann Forecasts of Maximum and Minimum Temperatures for Cork and Dublin. Internal Memorandum 115/98. Met Éireann, Dublin. 18pp & Appendices.

HIRLAM Group Technical Reports

McDonald, Aidan, 1998. Alternative Extrapolation to find departure point in a 'Two Time Level' Semi-Lagrangian Integration. HIRLAM Technical Report No. 34.
Cisco de Bruijn, 1998. Precipitation Forecasts with a Very High Resolution Version of HIRLAM for the Telflood Project. Technical Report No.37.
McDonald, A., 1998. The origin of noise in Semi-Lagrangian integrations. Technical Note 55. Met Éireann, Dublin.

HIRLAM Group Newsletter

McDonald, Aidan and Cisco de Bruijn. Impact of Filtering the HIRLAM Orography. HIRLAM Newsletter, No. 30.
McDonald, Aidan. Default *Horizontal Diffusion Coefficient in* HIRLAM-4. HIRLAM Newsletter, No. 31.
McGrath, Ray, Aidan McDonald, Peter Lynch and Jim Hamilton. *Verifications on Regular and Rotated Grids.* HIRLAM Newsletter, No. 31.
McGrath, Ray. *Moving to a 3-Hour Assimilation Cycle.* HIRLAM Newsletter, No. 31.
Kelly, Enda and Jim Hamilton. *Stretched Grids in the* HIRLAM *Model.* HIRLAM Newsletter, No. 31.
McDonald, Aidan. *Mass Conservation in* HIRLAM. HIRLAM Newsletter, No. 32.

In-house HIRLAM Progress Reports

No. 9 ModiRoadice: graphics editor for input to the road ice model (Eoin Moran and James Hamilton, February 1998)
No. 10 SATREP: Enhancements to XCHARTS (James Hamilton, February 1998)
No. 11 Graphical Modification of Sea/Swell/Wind forecasts (James Hamilton, May 1998)
No. 12 Changes to the Operational HIRLAM System - Moving to a 3-Hour Assimilation Cycle (Ray McGrath, May 20, 1998)
No. 13 A Kalman Filter Applied to 2m temperature (Eoin Moran, May, 1998)
No. 14 Making the Best Use of Boundary Fields (Ray McGrath, July 1998)
No. 15 Rainfall Forecasts with a refined version of HIRLAM for Hurricane Charley (Cisco de Bruijn, July 1998)
No. 16 Data Assimilation Experiments with the HIRLAM System (Ray McGrath)

Other articles

Other articles were written for Technology Ireland (Evelyn Murphy), Farmers' Journal (T. Keane), The Irish Scientist (T Keane and Cisco de Bruijn).

Forecast Accuracy

Accuracy of Forecasts

Under our QCS plan we are committed to produce a range of skill scores routinely. The following are some results of our current verification schemes.

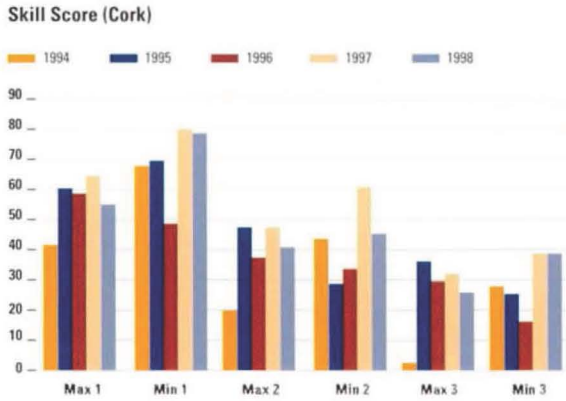
Temperature

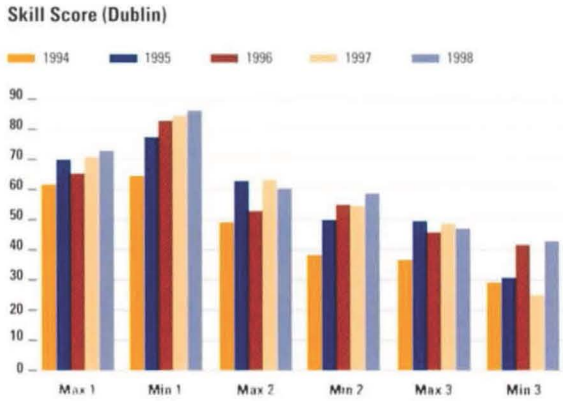
Early morning forecasts of maximum and minimum temperatures for Dublin and Cork for the current day and the subsequent two days are issued from our GFD. These forecasts are subsequently verified against observations for Dublin and Cork Airports. Various accuracy scores are calculated amongst which are the following for 1998:

	Error	Max 1	Min 1	Max 2	Min 2	Max 3	Min 3
Dublin	< 2°C	85.2%	91.0%	80.0%	68.5%	73.4%	55.6%
	2° to 4°C	14.2%	7.7%	17.3%	24.4%	23.0%	32.9%
	> 4°C	0.5%	1.4%	2.7%	7.1%	3.6%	11.5%
Cork	< 2°C	84.4%	90.7%	80.8%	69.0%	76.2%	64.4%
	2° to 4°C	13.7%	7.7%	16.7%	23.8%	19.7%	26.3%
	> 4°C	1.9%	1.6%	2.5%	7.1%	4.1%	9.3%

Results were better generally than in previous years with a higher proportion of forecasts within two degrees of the observations and a smaller proportion of errors over four degrees.

The following skill scores compare accuracy (as measured by root mean square errors) of the GFD forecasts with that attained using climatology as the forecast method. Perfectly accurate forecasts score 100% and accuracy only as good as climatology scores 0%.





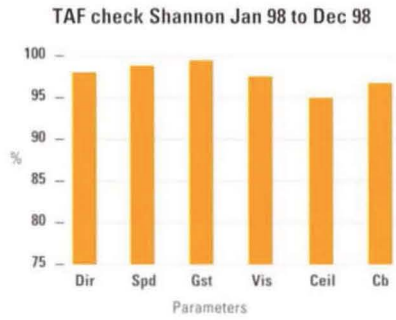
While this measure of skill indicates results not as good as 1997 in the case of Cork where the 1997 forecasts were exceptionally accurate, there are definite indications of an improving trend in the five year data.

NWP

Verification of our HIRLAM model output against the reports from our stations indicates root mean square errors in 2 metre temperature increasing from about 1.4°C at the start of the forecast period to 2.0°C at 48 hours. Corresponding figures for 10m wind speed are 1.8 and 2.5 m/sec.

Terminal Forecasts

There is an ongoing system for checking the terminal forecasts (TAFs) issued by the CAO (c.f. 1995 Annual Report). This checks for each hour that the TAFs are within allowable margins (as defined by the official WMO 'operationally desired accuracy') of the reported data. The results are presented here in graphical form for Shannon. The table shows the accuracy figures in percent for all airports.



	Direction	Speed	Gust	Visibility	Ceiling	Cb
Casement	97.2	98.9	99.2	97.0	94.4	97.1
Connaught	97.4	99.3	98.9	91.7	86.9	95.1
Cork	97.6	99.3	99.2	90.6	86.8	96.9
Dublin	96.9	99.5	99.5	96.8	94.3	97.4
Shannon	97.6	99.1	99.5	97.1	94.6	96.2

Staff Movements & Training

Staff Training

In parallel with the Training Needs Analysis, the normal training activities of Met Éireann continued as usual throughout the year. Staff attended many courses organised by the Organisation and Development Unit of the Department of Public Enterprise and by the Centre for Management and Organisation Development (CMOD) - these included training in relation to the Freedom of Information Act and the Performance Management System. In addition, several specialised courses relating to Met Éireann's specific training needs were organised. Among the latter were training in IT and instrumentation skills, presentation skills and advanced forecasting techniques. Two newly-recruited meteorologists attended Forecaster Foundation training courses at the UK Meteorological Office, and five trainee Meteorological Officers underwent initial training at Casement Aerodrome.

In all a total of 780 training days were availed of by staff during the year.

Eight personnel received support under the refund of 3rd level fees scheme.

Retirements

The following 7 staff retired during the year:

B Newman	Shannon Apt
L Shields	HQ
C Curran	Valentia Observatory
S O Seagdha	Valentia Observatory
M Meade	Cork Apt
M. O Griofa	Valentia Observatory
M. Mansfield	HQ
B McWilliams	Assistant Director commenced a Career Break on 03 June

Promotions

There were three promotions MO to SMO, one SMO to PMO, one MO to M and one SM to AD.

Recruitment

There were five MO recruitments during the year, one SO, one CO and one M.

Contract

A librarian was recruited on contract during the year. A meteorologist was temporarily employed at Shannon, one scientist completed his work on the Telflood and another began working in November on the EU funded project, FASTEX-CSS (Fronts and Atlantic Storm-Track EXperiment - Cloud System Study).

Met Éireann Finances

The figures presented below are approximate and for information only. They do not form part of the official annual accounts of Met Éireann.

Income and expenditure 1998/97

	1998	1997	1998	1997
	£,000	£,000	£,000	£,000
Salaries and Related Expenses (A1)			7,358	7,036
Other Operating Expenses			1,163	1,103
Capital Expenditure			875	327
Contributions to International Organisations			1,052	978
Total			**10,448**	**9,444**
Receipts from Eurocontrol (Route Charges)	4,897	4,238		
Receipts from Comm. & Cost Recovery Activities	695	690		
Total Receipts	**5,592**	**4,928**		
Net cost of operations			**4,856**	**4,516**
Some details of above				
A1				
Salaries			7,031	6,783
Overtime			251	168
Payment to Observers			59	58
Other Allowances			17	27
A2 (Travel & Subsistence)			108	99
A3 (Training/Library/Printing etc.)			182	140
A4 (Communications & Post)			230	230
A5 N/C (Computer non-capital)			200	225
A6 (Maintenance / Energy)			127	167
A7 (Consultancy)			21	4
A8 N/C (Equipment Consumables)			295	238
A5 Capital			268	129
A8 Capital			607	198
			9,396	**8,466**
F4 Commercial / cost recovery receipts				
Aviation	19	32		
Climatological Information	76	82		
General Forecasting	589	568		
Miscellaneous	3	-		
Publications	8	8		
	695	**690**		
EU Grants	22	55		

Note: 1 Euro = 0.787564 Irish Pounds

Corporate Information

Met Éireann Headquarters

Glasnevin Hill
Dublin 9, Ireland
Tel: +353-1-806 4200
Fax: +353-1-806 4247
e-mail: met.eireann@met.ie

- **Climatology and Observations**
  Tel: +353-1-806 4260
  Fax: +353-1-806 4216
  e-mail: climate.enquiries@met.ie

- **Commercial Division**
  Tel: +353-1-806 4244
  Fax: +353-1-806 4247
  e-mail: marketing@met.ie

- **General Forecasting**
  Tel: +353-1-806 4255
  Fax: +353-1-806 4275
  e-mail: forecasts@met.ie

Met Éireann
Connaught Airport
Knock
Co. Mayo
Tel: +353-94-67368
Fax: + 353-94-67390

Met Éireann
Cork Airport
Cork
Tel: +353-21-965 974
Fax: +353-21-313 539

Met Éireann
Dublin Airport
Co. Dublin
Tel: +353-1-844 5492
Fax: +353-1-844 4633

Met Éireann
Shannon Airport
Co Clare
Tel: +353-61-471 333
Fax: +353-61-472 737

Met Éireann
Valentia Observatory
Cahirciveen
Co. Kerry
Tel: +353-66-9472176
Fax: +353-66-9472442

Glossary

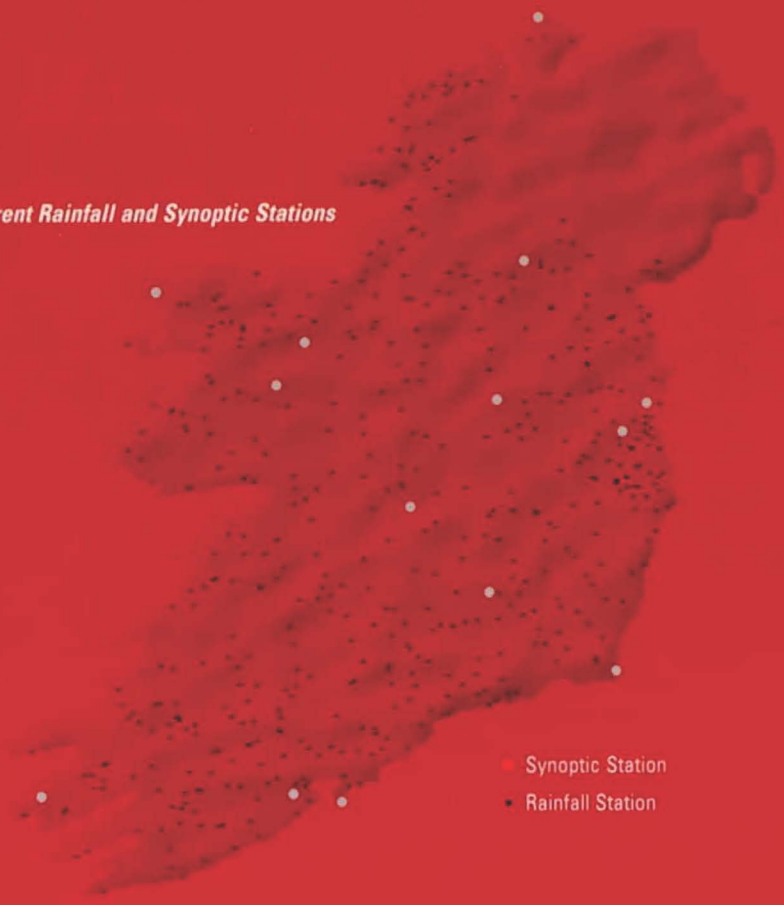
AD/OA	Assistant Director, Operations and Administration
AD/ST	Assistant Director, Scientific and Technical Support
ASAP	Automatic Shipboard Aereological Programme
AWS	Automatic Weather Station
CAFO	Central Analysis and Forecast Office
CAO	Central Aviation Office
CD	Commercial Division
CO	Clerical Officer
ECMWF	European Centre for Medium-range Forecasting
EUMETNET	European National Meteorological Services' Network
EUMETSAT	European Meteorological Satellite Organisation
GF	General Forecasting (Division)
HIRLAM	High Resolution Limited Area Model
I&EM	Instrumentation and Environmental Monitoring (Division)
ICWED	Informal Conference of Western European Directors of Meteorological Services
IT	Information Technology (Division)
M	Meteorologist
MO	Meteorological Officer
NOAA	National Oceanic and Atmospheric Administration
NWP	Numerical Weather Prediction
PMO	Principal Meteorological Officer
QCS	Quality Customer Service
R&A	Research and Applications (Division)
SATREP	Satellite Reports
SBU	Self Briefing Unit
SM	Senior Meteorologist
SMO	Senior Meteorological Officer
SO	Services Officer
TCS	Telephone Consultancy Service
WMO	World Meteorological Organisation

Photo credits

Aer Rianta
Bob Bateman Photography
EUMETSAT
Examiner
Fennel Photography
Ian Vickery Photography
Irish Times
Irish Renewable Energy Centre
John Collins
Metaphor Systems AS
Michael J Brennan
NOAA
Phillip Vardon
Jackie Sullivan
Wexford Wildfowl Reserve

Designed by Principle Concepts

Current Rainfall and Synoptic Stations



MET éireann