

VECTOR

Pointing to Safer Aviation

CNS/ATM – THE FUTURE IS HERE

YEAR 2000 CELEBRATIONS

FLIGHT PLAN vs SARWATCH

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Page 3 CNS/ATM – The Future is Here

You may have heard of the Future Air Navigation System (FANS) being talked about in the media recently. Aviation technology is changing very rapidly, and what was a concept yesterday is often reality today. FANS (more commonly known as CNS/ATM) is changing the way aircraft navigate and communicate and is helping to ease air traffic congestion around the world. This new technology is also likely to have implications for general aviation in the not-too-distant future. This article explains how the new system works.



Page 8 Year 2000 Celebrations

The New Year is going to be a busy time with a considerable number of aircraft movements predicted, especially in eastern areas. Because of this, it is important that pilots are fully briefed on the special use airspace and associated procedures that accompany the wide variety of Year 2000 events. *Year 2000 Celebrations* gives pilots a 'heads up' in this regard.



Page 10 Flight Plan vs Sarwatch

The introduction by the Airways Corporation of a charge to file a flight plan or a sarwatch in July of this year has seen a marked drop in the number of pilots utilising these services. In this article we outline what each service offers and leave you to decide what is most appropriate for the type of flying you do.



Page 12 Fuel Starvation with Quarter Tanks?

Ever thought that it was possible to suffer fuel starvation with nearly quarter full fuel tanks? Well, it has happened to several New Zealand pilots recently. This article stresses the importance of knowing your aircraft fuel system and its peculiarities.

Also Featuring:

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Cover Photo:

The Spiral Galaxy M100, one of the brightest members of the Virgo Cluster of galaxies.

CNS/ATM

The Future is Here

Aviation stands at the door of a technological revolution. Most of us have had some experience of GPS but will have had less with the ICAO CNS/ATM (Communications, Navigation, Surveillance and Air Traffic Management) system – often referred to as the Future Air Navigation System (FANS). In 1983 ICAO concluded that satellite technology would provide the solution to overcome the shortcomings of ground-based air navigation systems. It will become increasingly important that we become familiar with the new technologies as they are implemented – yes, even in relation to the general aviation environment.

Because of its technical nature, this article contains a considerable number of acronyms. Please do not let this deter you.

The CNS/ATM environment will be a major advance over current air navigation systems, which depend on expensive ground-based radio navigation aids. These new technologies will:

- Reduce costs by allowing aircraft to operate more efficiently on their desired routes and at levels that are more fuel-efficient.
- Allow increased airspace capacity.
- Improve the information available to pilots, the airlines, and ATS (air traffic service) to aid decision-making.
- Improve safety in terms of an aircraft's navigation capabilities and ATS collision avoidance surveillance (both aircraft and terrain).
- Other positive features of CNS/ATM include data linking and a more automated approach to aircraft traffic management.

Although CNS/ATM starts with a 'C' for communications, this article begins with 'N' for navigation because enhanced navigation capabilities is a key building block to the new environment.

Navigation

Global Navigation Satellite Systems

Although there are other global navigation systems, such as the Inertial Navigation System and the Inertial Reference System, we have chosen to concentrate on Global Navigation Satellite Systems in this section of the article.

Global Navigation Satellite Systems, such as GPS or GLONASS, consist of a constellation of satellites that are essentially very precise radio stations with extremely accurate clocks. Radio signals from at least four satellites are compared with one another to establish the position of the navigational receiver (ie, the GPS unit) in four dimensions, including altitude and time. GPS is now used worldwide for aviation purposes because it is such a readily accessible and accurate system.

On 17 June 1999 the European Union's Transport Ministers decided to go ahead with Galileo, a second-generation Global Navigation Satellite System, which is expected to be operational by 2008. Galileo will consist of 21 or 36 medium earth-orbiting satellites and will be compatible with GPS. Unlike GPS, the system will be under civilian control and will offer redundancy protection for Global Navigation Satellite System users. (The US military uses Selective Availability to degrade the accuracy of GPS signals to about 100 metres, in order to prevent highly accurate position data being used by foreign military or civilian agencies for aggressive purposes.)

Augmentation Systems

The Wide Area Augmentation System is being developed by the USA to further improve GPS signal accuracy and availability. Regional augmentation will be extended over thousands of kilometres by using space-based geostationary satellites and ground-based stations radiating corrective signals derived from a network of reference stations on the ground. Galileo will also be integrated with regional augmentation systems such as the European Geostationary Navigation Overlay System. Note that the application of CNS/ATM (which includes GPS) uses coordinates based on the World Geodetic System 1984 (WGS-84), which uses the centre of the earth as the datum. This replaces various less accurate sources, such as the New Zealand 1949 datum, which is 'centred' near Nelson.)

“The CNS/ATM environment will be a major advance over current air navigation systems, which depend on expensive ground-based radio navigation aids.”

For operations such as a precision approach, a Local Area Augmentation System can be provided by ground-based systems, which have demonstrated centimetre-accuracy. These are currently being evaluated as a possible replacement for Instrument Landing Systems. The other major advantage of Local Area Augmentation Systems is their ability to provide an approach system for more than one aerodrome. A Local Area Augmentation System station situated near Auckland could, for example, allow precision GPS approaches to be designed for Whenuapai and Ardmore, or any other aerodrome within 30 nautical mile radius of the station.

Note that the ICAO equivalent term for Wide Area Augmentation System is Space-Based Augmentation System and for Local Area Augmentation System it is Ground-Based Augmentation System.

Required Navigation Performance

Put simply, Required Navigation Performance (RNP) stipulates the degree of accuracy to which an aircraft's navigational system is required to perform. RNP aircraft must operate within a given volume of airspace for a pre-determined percentage of the flight. RNP10 aircraft, for example, are required to operate within a 10 nautical mile radius of required track position 95 percent of the time.

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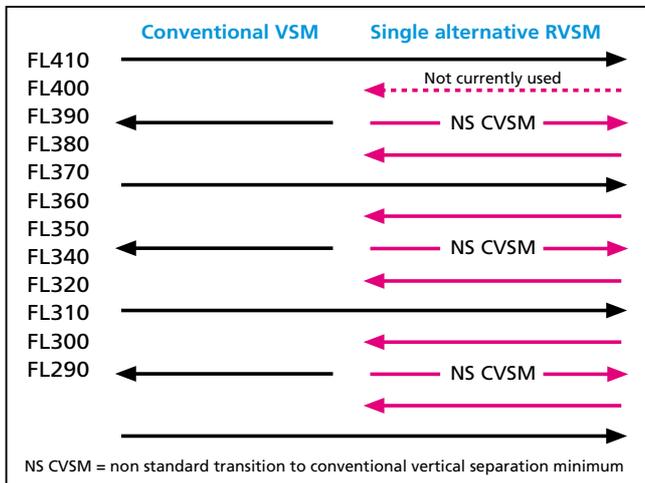
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Increased navigational accuracy (both laterally and longitudinally) can allow instrument approaches to be designed with reduced obstacle/terrain clearance. Terrain that is within a normal approach area (take a standard VOR/DME approach for example) may be outside the equivalent RNP instrument approach area. Thus approach minima may be lowered as a result of this narrower terrain window.

A recent example of this has been the successful application of RNP to approaches at Juneau, Alaska, where Alaskan Airlines have demonstrated an approach profile of better than 0.1 nautical miles, which is well within the 0.3 nautical mile design requirements. The RNP approach to Juneau's Runway 26 has a decision height of 337 feet amsl with a visibility requirement of one nautical mile. Runway 26 does not have a conventional instrument approach because of possible ILS terrain reflections, and it requires a circling approach off a non-RNP approach for Runway 08. This means a decision height of 1820 feet amsl, a visibility requirement of more than two nautical miles, and also a heavier pilot workload. Being an RNP-equipped aircraft in this case allows instrument approaches to be conducted in much lower weather minima (see accompanying approach plates).

Reduced Vertical Separation Minimum

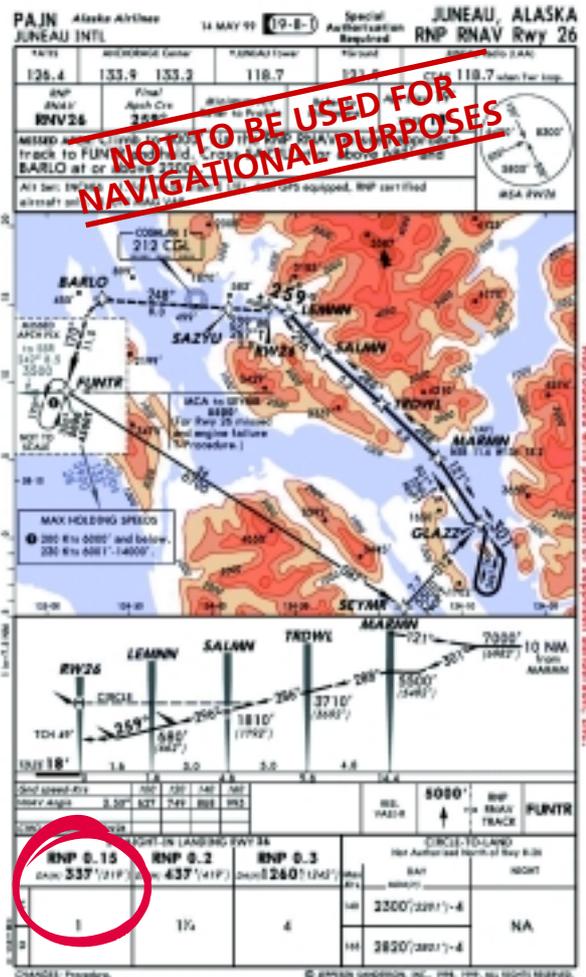
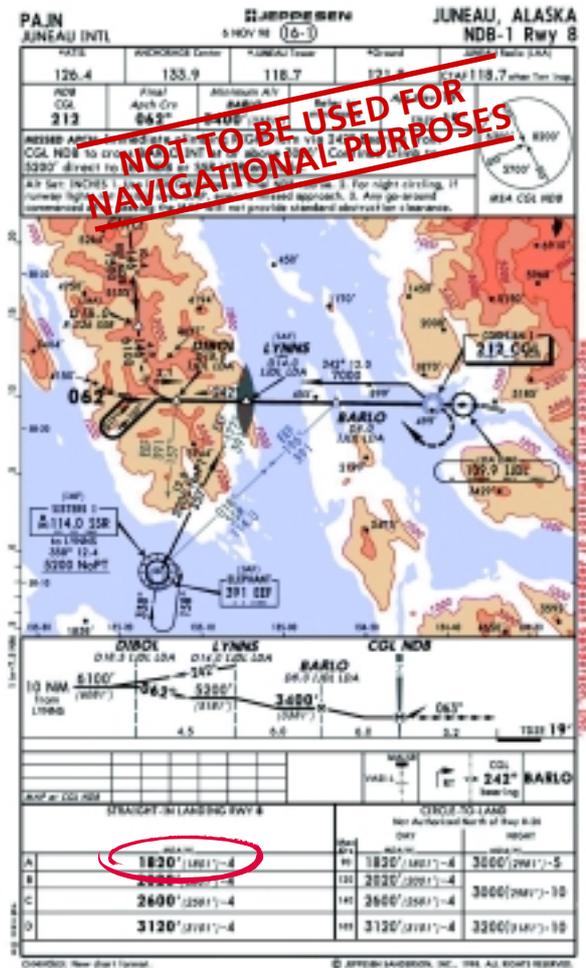
Modern altimetry systems, and the monitoring of aircraft altimetry accuracy within a Reduced Vertical Separation Minimum (RVSM) environment, has allowed the traditional 2000-foot separation required above FL290 to be reduced to 1000 feet. RVSM offers aircraft operators, and air traffic control providers, a major advance in airspace efficiency. North Atlantic trials have demonstrated that jet aircraft save approximately one percent in fuel for every 1000 feet closer they can get to their optimum cruising level. As a result of RVSM, ATC now have several additional flight levels available, which enable greater air traffic management efficiency (see table below).



New Zealand, on 24 February 2000, is expected to designate the Auckland Oceanic FIR, along with many other Pacific States, exclusively for RVSM-approved aircraft between FL290 and FL390. It is also proposed, on 13 July 2000, that the domestic (New Zealand) FIR be designated in a manner that allows RVSM and non-RVSM approved aircraft to operate coincidentally. A two-thousand-foot separation will apply however, between a non-RVSM aircraft and an RVSM-approved aircraft.

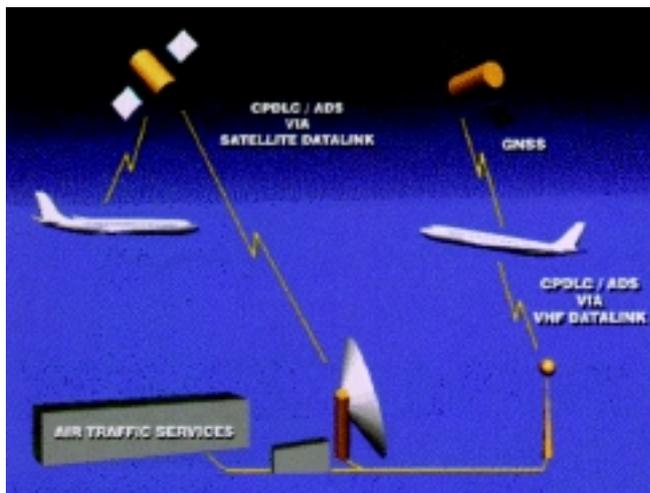
Other Approach Systems

Microwave Landing Systems were developed to replace Instrument Landing Systems to avoid frequency interference



VECTOR would like to acknowledge Jeppesen Sanderson, Inc. for allowing us to reproduce the above Instrument Approach Plates.

problems and allow curved approaches. Transponder Landing Systems use ground stations and triangulation to establish aircraft position from transponder reports. Microwave Landing Systems are currently being used in North America and Europe, while Transponder Landing Systems are still being developed.



Communications

ATC/Pilot Datalinking

Controller Pilot Data Link Communication (CPDLC) is the use of a data link between an aircraft and ATC. Oceanic HF radio communication is affected by atmospheric conditions, which means that it can be unreliable and subject to interference. CPDLC allows quiet and efficient communication using Ground Earth Stations (satellite stations), radio datalink, and satellites to relay the signals. CPDLC data links are normally numbered and pre-formatted, but free-text messages are also possible. Secondary Surveillance Radar is also capable of supporting datalink between aircraft and ATC.

SATVOICE

SATVOICE (Satellite Voice) allows pilots and controllers to communicate using satellites such as INMARSAT. It tends to be used for abnormal situations only (ie, emergencies), as it is not currently approved as a required communication system and can be expensive to use.

Aeronautical Telecommunication Network

The Aeronautical Telecommunication Network is like an Internet for aircraft, airlines, and ATC. It enables voice and data to be transferred over dissimilar networks using a digital communication protocol based on the Open Systems Interconnection model instead of the current, and more widely used, character-based protocol. ICAO-based ATN is being developed in Europe and the USA, and it will handle three basic types of aeronautical services:

- ATS Facilities Notification, which effectively opens a pipe between ground-based equipment and an aircraft or its operations base.
- Automatic Dependent Surveillance (see below for details).
- Controller Pilot Data Link Communication.

Surveillance

Automatic Dependent Surveillance-Addressed

Automatic Dependent Surveillance-Addressed (ADS-A) sends datalink information directly from the aircraft Flight

Management System **on demand** from ATC or the aircraft operator. This enables a display of aircraft position, altitude, and other data. This situational display is independent of radar coverage. Up to four ATC units can log on to an aircraft for ADS reports, but only one may communicate using Controller Pilot Data Link Communication, ensuring control by a single ATC unit at any one time.

Although an ADS display may look like a radar picture, it is not an independent surveillance system like radar. Rather, it relies on the accuracy of information that is transmitted directly from aircraft navigation systems. ADS is unlike the real-time radar environment because ADS datalink reports are normally sent at set intervals or positions only. In an oceanic environment, ADS updates are required every 15 to 30 minutes – unless ATC require an on-demand report. ADS is not used by itself to separate aircraft, but it may be used to monitor other separations, such as RNP criteria.

Automatic Dependent Surveillance-Broadcast

The ADS-Broadcast (ADS-B) is an **automatic** broadcast by datalink from the aircraft to all stations. By providing a cockpit display of traffic information, it enables pilots the flexibility to be able to manoeuvre their aircraft so as to avoid other aircraft, while under ATC supervision. This can be readily achieved using the most advantageous route.

“EGPWS uses GPWS technology combined with a terrain database and GPS to determine where the aircraft is in relation to obstacles ...”

In contrast to Traffic Alert and Collision Avoidance System (TCAS), ADS-B displays aircraft identification and velocity vectors at ranges of more than 100 nautical miles, but it does not provide resolution advisories to potential conflicts. ADS-B provides an accurate aircraft position report derived from a built-in GPS receiver and/or a Flight Management System. Datalinking between ADS-B equipped aircraft helps pilots maintain situational awareness. ADS-B and TCAS technologies may eventually be combined within the one unit to become even more effective. Weather information and ATC radar data from transponder-equipped aircraft could also be displayed.

Datalinking is currently being developed to avoid cross-transmissions by using time-division technology, which ‘listens out’ before transmitting to avoid ‘crossed’ transmissions. There are a number of types of data link. These are:

- USA-developed Universal Access Transceiver (966 MHz).
- SSR Mode S (1090 MHz).
- ICAO-approved mode-2 VHF Data Link.
- Mode-3 Time Division Multiple Access supporting both voice and data.
- Swedish mode-4 Self-Organising Time Domain Multiple Access.

Enhanced Ground Proximity Warning System

Enhanced Ground Proximity Warning Systems (EGPWS) have been developed from the first-generation GPWS, which has proved to be an invaluable tool in helping to avoid Controlled Flight Into Terrain. The prevention of Controlled Flight Into

Continued over...

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Terrain is a high priority in accident prevention worldwide.

GPWS uses a radio altimeter (equipment that helps determine the aircraft height above ground) combined with landing gear, flap, and airspeed information to warn the pilot when the aircraft is getting too close to the ground. GPWS is limited, however, in that it is often only able to provide a few seconds warning of an impending collision – sometimes none at all if the obstacle is vertical.

EGPWS uses GPWS technology combined with a terrain database and GPS to determine where the aircraft is in relation to obstacles, and it includes a premature-descent alert function. This provides the pilots with a warning when they are flying towards obstacles that are below the aircraft's normal approach path or when an excessive closure rate with terrain occurs.

A cockpit display indicates obstacles of concern by using a colour-coded system. As the aircraft nears an obstacle its representation changes from yellow to red depending on the threat that is posed. An aural warning “whoop, whoop, terrain, pull up” will eventually follow. Flight tests of EGPWS have provided warnings of more than one minute, which is a significant improvement over GPWS.

Air Traffic Management

ATS Inter-facility Data Communications

ATS Inter-facility Data Communications is an automated transfer of aircraft flight plan details (such as route and cruising level information) by electronic means to adjacent ATC units instead of by conventional voice or teleprinter transfer.

Dynamic Airborne Route Planning Systems

Dynamic Airborne Route Planning Systems (1) are single re-routes, supplied by ATS, enabling airborne aircraft to select a track that is more advantageous to them in terms of weather and direct routing.

Dynamic Airborne Route Planning Systems (2) and (3) permit single and multiple re-route procedures and are supplied by the aircraft operator. They allow pilots to fly the optimum route, subject to ATC approval. They are an important step towards ‘free flight’.

Oceanic Control System

The Oceanic Control System (OCS) facility at Auckland is the world's first operational fifth-generation ATC system. The OCS is revolutionary in its concept. Modern ATC systems have evolved from early facilities that had no radio, to facilities using radio and radio-navigation aids, then to radar, and finally to the datalink environment. The OCS has advanced beyond these by providing a platform where machine automation, rather



Photo courtesy of Airways Corporation of New Zealand.



than a controller, is responsible for detecting aircraft conflicts.

The OCS incorporates an automatic conflict probe, which uses aircraft positional data from radar, ADS, and HF pilot reports from non-ADS aircraft. This provides a visual display on an Aircraft Situation Display of traffic operating over remote areas. Air traffic controllers using

OCS can probe for traffic manually upon a pilot's request for a level change. The OCS will then automatically probe the actual flight path, thus reducing the chance of human error. The OCS is capable of datalink communications using Controller Pilot Data Link Communication for aircraft and ATS Inter-facility Data Communications between ATS units. AIDC and the conflict probe are the most critical applications for DARP procedures, to allow ATC to effectively control aircraft operating with freedom of route selection by course and conflict prediction.

“RVSM offers aircraft operators, and air traffic control providers, a major advance in airspace efficiency.”

OCS also incorporates SATVOICE as a backup communications medium, electronic flight progress strips, weather and NOTAM databases, flight data processing, and automated flight plan monitoring. The screen display (including mouse movements) is all recorded and has a playback feature for controllers.

Air traffic controllers operating the New Zealand OCS are the first in the world to be given an ADS rating, which allows them to use it and other datalink technologies to provide Air Traffic Management. The workstation has a swipe card for personal settings.

Required Navigation Performance

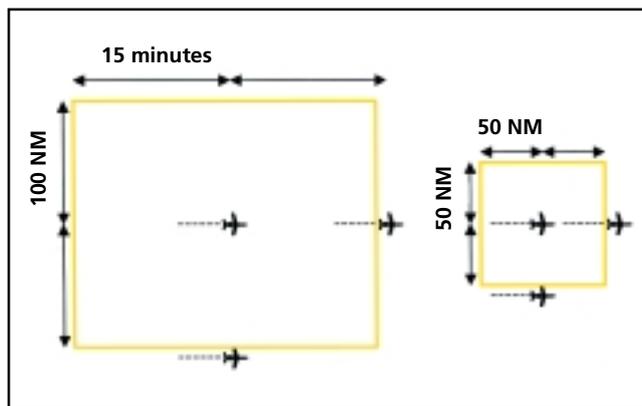
While Required Navigation Performance (RNP) is a navigation capability, it also has major significance for ATC. Because of the vastly improved navigational accuracy that is made possible by Global Navigation Satellite System, it is possible to use reduced horizontal separation between aircraft, both laterally and longitudinally. These are determined by complicated mathematical collision risk calculations, which are compared with a known safety target. A standard safety target for the RNP environment, for example, is 5.0×10^{-9} . This is a very small chance of an accident occurring!

The RNP concept accepts that an aircraft will 'wander' about its predicted track, within given parameters. ATC has traditionally applied separation between aircraft themselves and has therefore relied on an aircraft theoretically maintaining its track centreline. In reality, even in a non-RNP environment, this is not possible 100 percent of the time.

There is some thought that RNP criteria should be applied as a **nominal** separation (like the 1000-foot vertical separation that has allowance for a 300-foot variation), which will allow for the specified RNP variation.

The Auckland Oceanic FIR was, in December 1998, the first in the world to be fully designated as RNP10 airspace above FL245 (excluding the Antarctica McMurdo Sector). It allows 50 nautical mile longitudinal and lateral separation to be applied between RNP-approved aircraft (see accompanying diagram). Eventually, as new route structures are implemented and the navigational performance of aircraft improve, lesser separations (such as 30 nautical mile RNP4) will safely allow higher traffic densities. This has particular significance for domestic airspace, where traffic density is steadily increasing.

Comparative volumes of airspace using standard and RNP10 separations



Summary

These technologies may be referred to as the Future Air Navigation System, but they are in fact here now. The ICAO CNS/ATM system not only provides the pilot with more in-flight information that allows them to make better decisions, but also permits greater navigational flexibility than ever before. CNS/ATM will better accommodate larger traffic volumes at increased levels of safety, save time and fuel, and reduce stress in the process.

Aspects of these new technologies are likely to affect the general aviation environment, in much the same way the introduction of GPS has over the last decade. We suggest that all aviators keep abreast of these changes, as they are likely to have implications for all types of flying in the not-too-distant future. Watch out for more information in future issues of *Vector*. ■

America's Cup Reminder

We would like to remind pilots that the America's Cup Challenger Series is well under way and that there is likely to be a considerable increase in aircraft activity in the greater Auckland area over the next four months – especially during the final America's Cup racing in February and March 2000. It is important that all pilots are aware of, and abide by, all designated special use airspace procedures and requirements. Pilots are **not** permitted to enter America's Cup restricted area airspace unless they are 'approved'. This means having returned a signed confirmation document to the Controlling Authority, stating that they have read and understood the America's Cup pilot briefing package. Contact Airways Corporation to request an approval package by faxing them on 0-9-417 7873.

Please refer to *Vector* '99, Issue 4 or AIP Supplement 75/99

(effective 12 August 1999) for details and a timetable of events. (Note that the southeastern boundary of **NZR191 Devonport** depicted in the *Vector* article has since changed slightly. The new boundary is correctly depicted in the AIP Supplement and on the CAA web site.)

Alternatively, visit the CAA web site at www.caa.govt.nz under **Aeronautical Services – America's Cup** for this information and more. Note that a notification service is also available from this web site, which will keep you up to date on pertinent information. This service is free and can be found under **Services – Notification Services**.

Before flight (having studied the AIP Supplement) make a final check for any applicable NOTAMs before venturing near any America's Cup special use airspace – this is particularly important if you are not familiar with the area. Enjoy the Cup!

Year 2000 Celebrations

Considering being skyward during the New Year period? If so, then this article will be of interest to you, as there will be a number of special use airspace designations that may affect you. In addition there are a range of good aviation practice issues to take into consideration when planning and conducting your flight(s) during this busy period.

Pilots are advised that there is likely to be an increase in aircraft activity around the country, particularly in east-facing regions, over the New Year period. Because of this, and the large variety of special activities (such as scenic flights, skydiving, aerial photography, and pyrotechnic displays) that are likely to occur, it is important that pilots are aware of the associated special use airspace and procedures. See the accompanying table for examples of Year 2000 celebration activities.

Restricted Airspace and Danger Areas

There are two restricted areas and two danger areas that have been prescribed by the CAA to cater for a number of these events (see accompanying illustrations). It is important that all pilots are thoroughly briefed before venturing in to these areas and understand the nature of the airspace that they are entering. This includes reading all relevant AIP Supplements and area NOTAMS before getting airborne.

For more detail please refer to AIP Supplement effective 2 December 1999 (AIRAC cycle 99/12). **Note:** Check AIP Supplement effective 30 December 1999 (AIRAC cycle 99/13) as it may contain

Examples of Known Special Activities		
Place	Time (NZDT)	Activity <small>* Includes safety buffer</small>
Matamata	31 DEC- 01 JAN	Night skydiving
Tauranga Harbour	0445-0500, 01 JAN	2 barges, pyrotechnics (1.0 km radius, 2000 ft amsl*)
New Plymouth	0000-0015, 01 JAN	Pyrotechnics (0.5 km radius, 1200 ft amsl*)
Greytown	0500-0600, 01 JAN	Release of 1000 helium-filled balloons
Martinborough	0000-0015, 01 JAN	Pyrotechnics (0.5 km radius, 2000 ft amsl*)
Wellington	0000-0015, 01 JAN	Lambton Harbour pyrotechnics (1.0 km radius, 2000 ft amsl*)
Christchurch	2200, 31 DEC- 0030, 01 JAN	North Hagley Park pyrotechnics (1.0 km radius, 2000 ft amsl*)
Mt Kohurau, W. Oamaru	0000-0015, 01 JAN	Pyrotechnics (0.5 km radius, 7000 ft amsl*)
Waitemata Harbour	2345, 31 DEC 99 - 0030, 01 JAN	Pyrotechnics

updated information that supersedes that contained in any earlier Supplement.

Year 2000 celebration activity planning is still, however, occurring at various locations around the country. So please check the CAA web site, www.caa.govt.nz, to remain abreast of any possible changes.

Location Specific Information

Chatham Islands

Pilots who are considering flying to the Chatham Islands to see the New Year in are reminded of the Civil Aviation Rule requirement to file a flight plan when proceeding more than 50 nautical miles from shore. Also, aircraft operating within 25 nautical miles of the Chatham Islands should maintain a listening watch and transmit their intentions on the local unattended frequency, 118.1 MHz.

Pilots are requested not to operate east

of a line Rangaika (848 feet, Chatham Islands) to Hapeka (751 feet, Pitt Island) because of international television broadcasts.

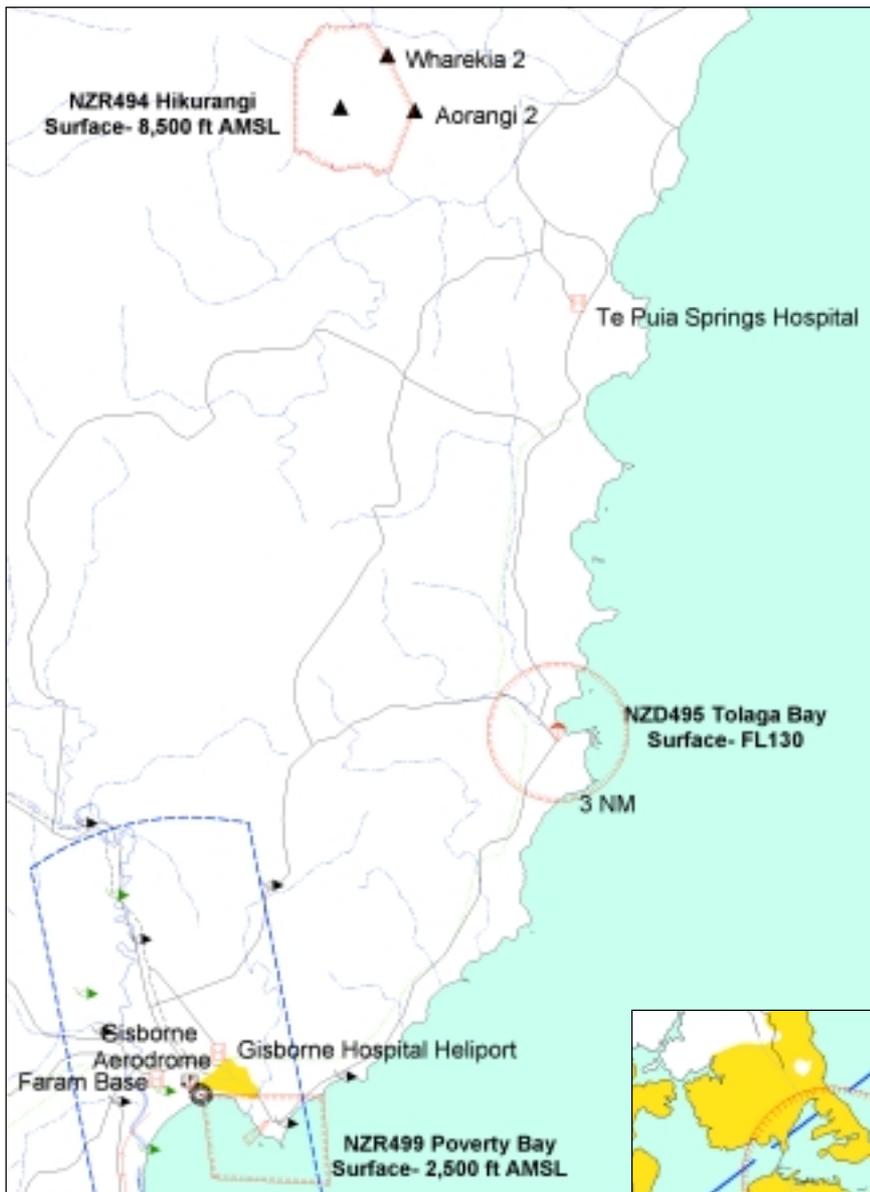
Gisborne

The operation of NZR499 may have a bearing upon aircraft arrival and departure procedures at Gisborne. VFR traffic should contact Gisborne Tower well in advance of the control zone boundary, giving their position and intentions. Established Visual Reporting Points should be used where possible.

There may be periods at Gisborne where traffic densities mean delays in arrivals and departures. Gisborne air traffic control is procedural (ie, no radar coverage is available), so plan your fuel endurance accordingly.

Aircraft congestion on the ramp at Gisborne is likely to restrict access to AVGAS from time to time. Mobile refuelling options are currently being

Year 2000 Celebration Restricted and Danger Areas



investigated. Access to the JET A1 pumps is unlikely to be impeded.

Gisborne's Airport operator, the Gisborne District Council, is planning to issue a modified airport Ground Movement Chart. Refer to AIP *Supplement* effective 2 December 1999 (AIRAC cycle 99/12) for details.

Further information relating to the above points can be obtained from Gisborne Airport's manager. Contact details are in the VFG. Be sure to also check the latest AIP *Supplement* and NOTAMs for any additional information on Gisborne Airport operations over the Year 2000 Celebration period.

Wairoa

Wairoa airfield will be available for use over the New Year period, subject to obtaining operator permission. Contact details are in the VFG.

Tolaga Bay

A private airstrip at Tolaga Bay will be used for a Year 2000 Celebration parachuting event. NZD495 has been prescribed to cater for this event and is centred over the airstrip. Refer to AIP *Supplement* effective 2 December 1999 and the accompanying map in this article for details.

Ruatoria

This private airfield to the east of Ruatoria is available for general use subject to the prior agreement of the operator. Contact the operator on 0-6-864 7754 to find out more.

Te Araroa

The short airstrip located on the foreshore at Te Araroa has not been maintained in recent years and is not available for use.

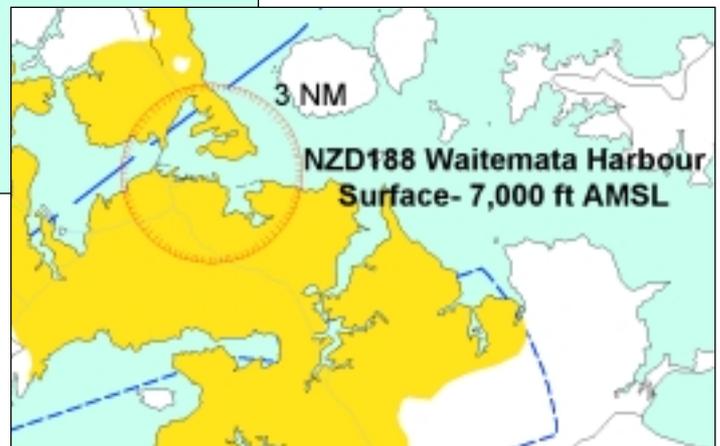
Opotiki, Whakatane

Both of these airfields are available to the public. No special activity or restrictions have been notified at either airfield.

Air Traffic Services

There is no effective radar coverage in the East Coast region below 8000 feet amsl. VHF radio coverage is also quite limited at lower altitudes (below about 3000 feet amsl) and especially to the north of Gisborne beyond Tolaga Bay. Pilots are advised to study the FISCOM chart, paying particular attention to the split coverage between Gisborne Tower and Napier Tower in the region. The use of half-hour position reports, in addition to maintaining a listening watch on 119.1 MHz, is also advised. Do not hesitate to 'broadcast blind', nor to request that other traffic pass on your report.

Should you wish to operate above 9500 feet amsl, remember that an ATC clearance is required before entering controlled airspace. Remember also that it is IFR territory – so beware!



Morning Civil Twilight

Remember that you cannot legally fly at night (ie, just prior to MCT), unless you hold a current night rating. You might like to get current now in anticipation of a clear morning on the day.

A Final Comment

Because of the magnitude of Year 2000 celebrations, we ask that you take special care if you take to the skies over the New Year period. Let's go into final year of the millennium as we mean to go on in the next – accident free! ■

Flight Plan vs Sarwatch

The decision by Airways Corporation to introduce a charge for VFR Support Services, including a charge for VFR Flight Plans and for Sarwatch, has focused attention on what these services provide.

There is still ongoing research and discussion into the whole issue, but here we outline the elements involved in each service to enable pilots to decide what is suitable for their needs. As Sarwatch is the cheaper option offered, this service is being closely looked at by sectors of industry.

An exemption to rule 91.307 *VFR Flight Plan* was issued on 17 August 1999 to allow a Sarwatch (as well as a flight plan) to be acceptable for a pilot requiring an alerting service.

The new Sarwatch service is expanded from what was available before, and it has taken some time for the new details to be promulgated, but they have been included in the NZAIP *Planning Manual* amendment and VFG *Change Notice* of 4 November 1999.

Flight Plan

Details

AVFR flight plan includes the following information:

Aircraft identification, aircraft type, ETD, route and intermediate aerodromes, TAS, altitude and EET for each route segment, alternate aerodromes, total EET, fuel endurance, radio frequencies carried, nav and approach aids, persons on board, name of pilot, identity of operator, emergency and survival equipment, and any other information.

Administration and Service

A flight plan should be submitted by phone or fax to the National Briefing Office at Christchurch. A freephone number 0800 NBOPLN (0800 626 756) and freefax number 0800 NBOFAX (0800 626 329) are provided. (If no other means is available, the plan may be filed by RTF in flight with the appropriate Air Traffic Services unit.)

On receipt of the flight plan, the information is checked (eg, that route EETs and total EET make sense) and any weather or NOTAM information issued in the last 90 minutes is passed to the pilot to update the weather/NOTAM information that they already have. The flight plan is then sent to air traffic



Photo by David Jones of the Airways Corporation of New Zealand

services at all flight-planned landing stops and to Flight Information Service sectors along the flight planned route. Flight information is offered pro-actively, eg, any changes in weather or NOTAM information that may affect the flight are passed to the pilot. Traffic information and flight information are available on request. Position reports are logged for alerting purposes.

“... a Sarwatch (unlike a flight plan) is not automatically terminated when the final landing is at an attended aerodrome.”

An alerting service is provided which will be activated 30 minutes after ETA at final destination (or if overdue at intermediate stops at attended aerodromes). It is important, therefore, to advise any changes of 30 minutes or more to any ETA which would affect this.

A flight plan may be terminated with any ATS unit or flight information sector or by phoning the National Briefing Office on 0800 626 756. A flight plan is terminated automatically upon landing when the final destination is at an attended aerodrome.

Sarwatch

Details

A Sarwatch includes the following information:

Aircraft registration, aircraft type, route details including destination or VFR

standard plan identification, fuel endurance, number of persons on board, the ‘Sartime’, and remarks including the name of the pilot in command.

The Sarwatch service was originally intended mainly for local flights, but the service has been expanded to be useful for longer cross-country flights.

Administration and Service

A Sarwatch may be submitted to the National Briefing Office on 0900 NBOSAR (0900 626 727) or filed in flight. If necessary, the 0800 NBOPLN (0800 626 756) number may be used.

A Sarwatch may be terminated with any ATS unit or flight information sector. Pilots terminating by RTF must indicate that they are operating on a Sarwatch by using the phrase “Terminate Sarwatch”. Alternatively, phone the NBO on 0800 626 756.

If the Sarwatch is filed with the NBO, although not essentially part of the service, the Flight Information Officer (FIO) would check for any amendments to NOTAM data or weather information in the last 90 minutes. The Sarwatch information is entered into a database and can be accessed by an ATS unit, but the information is not pro-actively passed to them (so they may not be aware of it unless they have a need to access it).

Notification of new weather information (SPARs, SIGMETs, amended TAFs, and SPECIs on unattended aerodromes, eg, Taupo – generically called HAZMET) when received is broadcast on all FISCOM frequencies, and pilots can then request details if desired (in the flight-plan case

this information is pro-actively passed on to each affected aircraft). In addition, a list of the weather and NOTAM information received in the last 90 minutes is generally broadcast on the hour during daylight hours.

Traffic information is available on request, and position reports will be recorded.

With a Sarwatch, alerting action starts at the nominated Sartime. Initial checks involve calling on frequencies, phoning a volunteered cellphone number, or checking with ATS units en route. If no information can be obtained, the RCC (Rescue Coordination Centre) is advised no later than Sartime plus 15 minutes. Hence it is **very important to terminate** Sarwatch (or amend the Sartime) **before** your nominated Sartime.

There are other possible enhancements of the service being mooted, such as specific transponder codes for VFR aircraft. This would reduce the need for position reports by providing a different method of flight following. This would relieve RTF congestion on the flight information frequency. Pilots should remember, however, that many parts of the country do not have SSR coverage at normal VFR altitudes, so this would not be successful everywhere.

A position report can serve two purposes: to indicate your last known position for alerting purposes, and to let other traffic in the vicinity know of your presence for collision avoidance purposes. So the transponder proposal introduces the need for consideration of this second aspect. These ideas are still in the conceptual stage, but new developments are possible that could result in a more efficient system without compromising safety.

Points to Note

- Don't be tardy in terminating your Sarwatch – there is not the 30-minute buffer added to a flight-plan ETA. You nominate your Sartime – so choose a time which suits your alerting requirement. For example, you may choose to make it 15 to 30 minutes after your expected ETA to provide a buffer for a late arrival. On the other hand you can call up and amend the Sartime at any time using the phrase "Request amend Sartime to" or "Request extend Sartime to ..."
- Pilots should also note that a Sarwatch (unlike a flight plan) is **not** automatically terminated when the final landing is at an attended aerodrome. Also, a Sarwatch termination must be acknowledged.

- When you approach a controlled aerodrome on a Sarwatch rather than a flight plan, the controller will not necessarily be aware of your impending arrival until you call up for clearance into the zone and ask for joining instructions. This can provide difficulties for controllers in sequencing traffic, and it is possible that you could be held or otherwise delayed for sequencing behind known flight-planned traffic. It helps the controller if you report your aircraft type on your first call.
- Whether on a Sarwatch or a flight plan (or neither), information and assistance will be given on request – there is no charge.

Pre-flight Planning

Rules 91.217 and 91.221 require a pilot to have carried out certain pre-flight planning actions, including such things as weather, fuel, aerodromes, comm and nav facilities, and appropriate charts.

Weather and NOTAM information is available to registered customers through the Airways Fax On Demand Service on 0800 654 957, or through computer on 0800 COPILOT (0800 267 4568). It is also available via telephone on 0900 PREFLT (0900 773 358).

Thorough pre-flight planning should be carried out for every flight, whether on a flight plan (where more detailed information is filed) or on a Sarwatch. Even if you're on Sarwatch, you still need to have calculations of headings, elapsed times, fuel figures, etc, recorded in order to have a safe and efficient flight. It would be good practice (and has been adopted by some flying training organisations) that, if you choose to fly on a Sarwatch, you fill in all the information on a flight-plan form first and then extract the necessary information to file your Sarwatch. This will help ensure that you still carry out adequate planning for the flight.

In Flight

- Maintain a listening watch on the appropriate FISCOM and unattended frequencies.
- Make position reports as you consider appropriate.
- Use your transponder.
- Request weather or NOTAM information if required.
- Don't hesitate to ask for assistance if you need it.
- Remember to terminate your flight plan or Sarwatch. ■

ILS Drama

Recently, an Australian ferry crew flew a British Aerospace Jetstream from Sydney to Wellington via Norfolk Island.

A temporary HF (high frequency) radio was fitted in accordance with normal practice for the ferry flight, and it was removed after the aeroplane arrived in Wellington.

Approaching Wellington, the crew was cleared for an ILS approach on Runway 16. Early in the approach, the radar controller noticed that the aeroplane was diverging from the localiser course and descending below the glideslope. He instructed the crew to climb to 3000 feet and gave them an intercept heading, after which the crew continued with the approach.

About four miles from touchdown, the aeroplane again deviated from the approach, this time heading towards Mount Victoria in IMC. The tower controller advised the crew, who made an immediate missed approach. The aeroplane subsequently made a successful ILS approach to Runway 34.

The Captain advised that the temporary HF seemed to be the cause of the problem. Earlier in the ferry flight, transmissions on the HF radio had caused engine gauge fluctuation, and on the ILS approach the Captain's ILS indicators had been affected, although the copilot's gave normal indications. As the Captain was the flying pilot at the time, he naturally followed the indications on his side, and the differences were not detected before the radar controller's warning.

A subsequent full avionics check on the aeroplane (after the removal of the HF set) revealed no abnormalities.

With the hindsight obtained from the safety investigation, one can see that a useful strategy would have been to turn off the HF once it was no longer required, given that it appeared to have caused instrument indication problems earlier in the flight.

Fuel Starvation with Quarter Tanks?

The Incident

Some months ago, the pilot of a Cessna 180 experienced fuel management problems while engaged in parachute dropping at a provincial airport. The aeroplane was descending through 1500 feet on a high left base for the main runway, when the pilot made a MAYDAY call, reporting that the engine had failed. The pilot made a safe landing on the secondary cross runway, for which the aircraft was well placed. The engine was started and ran normally after landing. It was determined that the fuel tank outlet had become unported during the descent, causing fuel starvation to the engine.

but the situation lives on, particularly as there are still 45 affected models on the register.

A Further Incident

Since the incident featuring the Cessna 180, an accident involving a para-drop Cessna 206 has been reported to the CAA.

After the parachutists exited the aeroplane at 10,000 feet, the pilot began a descent, during which the engine failed somewhere in the region of 7000 feet. The pilot changed tanks but was unable to restore power so changed back to the originally selected left tank. Still unable to restore power, the pilot carried out a forced landing

fuel tank outlets, causing fuel starvation and engine stoppage. Therefore, with low fuel reserves, do not allow the aeroplane to remain in uncoordinated flight for periods in excess of one minute."

The pilot was not aware of this note.

It is possible that, during the descent from 10,000 feet, the pilot may have been flying slightly out of balance, and the fuel tank outlets may have been uncovered.

Yet Another Incident

A further possible fuel starvation event occurred on another Cessna 206 shortly after takeoff. The pilot carried out a right turn onto the runway at a fairly high speed at a higher than usual power setting and began a rolling takeoff. At approximately 800 feet, a partial power loss occurred, followed by a complete power loss shortly thereafter. Trouble checks were carried out, and the fuel selector was changed from the left to the right tank. Engine power was restored approximately 20 seconds later, just prior to touchdown on the departure runway. Fuel tanks were dipped, and the aircraft was found to have 105 litres on board, 50 and 55 litres in respective tanks. A thorough engineering investigation was carried out on the aircraft, with no defect or contamination of any kind found.

Subsequent test flying was carried out with 55 litres of fuel in each tank in an effort to determine the cause of the power loss. It was found that, by placing the aircraft in an unbalanced situation, right rudder and left tank selected and vice-versa, a complete engine power loss occurred after about 50 seconds. Power was restored after about 12 seconds by returning the aircraft to balanced flight and carrying out the published flight manual procedures.

A Timely Reminder

All of these incidents serve as a timely reminder for pilots to consider how extensive is their knowledge on the type of aeroplane(s) they are currently flying. The fuel system description in an aircraft flight manual is very detailed, and it includes precautions and procedures for deliberately running a tank dry, including the restoration of power after engine stoppage for that reason. The importance of being familiar with the aircraft fuel system (and its associated procedures) cannot be stressed enough. Sometimes the differences between aircraft models can be greater than anticipated – all the more reason for receiving a comprehensive type rating from someone who really knows the aircraft. ■

Vector would like to acknowledge the efforts of Jim Lyver in preparing this article.



The Reason

The aircraft involved is a Cessna 180B model, which has only one fuel outlet per tank, located about the mid-point on the inboard edge of each tank. Prolonged sideslip, or steep descent, with low fuel quantities can unport the fuel outlet and cause fuel starvation to the engine. C180E and subsequent models have two outlets per tank, one forward and one aft, and are not subject to the same problem. The two tank outlets on the C180E and subsequent models reduce the unusable fuel quantity to 18 litres compared with 36 litres for the earlier models.

Although no warning is published in the aeroplane Flight Manual, the CAA Safety Investigator was interested to find a 1961 CAIC/AIR during the course of the investigation, which referred to the problem. The CAIC stated that: "... a prolonged sideslip in the direction of the tank in use, or a prolonged steep descent, can cause engine fuel starvation if the fuel quantity is low, since the fuel tank outlet may become uncovered in these attitudes." The CAIC has long since been cancelled,

on the airfield. Unfortunately the result was a heavy landing that damaged the aeroplane.

Engineers later drained the fuel tanks, dismantled the aeroplane, and measured the quantities as 15 litres from the left tank and 25 from the right. The left fuel line to the fuel-metering unit was found to be empty.

The pilot indicated that the aircraft had been out of the air for some 10 months. During a ferry flight, after refurbishment and before the engine failure, he noted the need to have considerable rudder trim to maintain balanced flight with reference to the turn-and-slip indicator. He also noted that the aircraft symbol in the turn-and-slip indicator was rocking considerably. It is possible that the turn-and-slip indicator was providing an incorrect indication of balanced flight.

The aircraft Flight Manual contains the following note in the fuel system description section:

"Unusable fuel is at a minimum due to the design of the fuel system. However, with 1/4 tank or less, prolonged uncoordinated flight such as slips or skids can uncover the

How To – Fill the

The CAA publishes two series of information booklets.

The **How To** series aims to help interested people navigate their way through the aviation system to reach their goals. The following titles have been published so far:

<i>How to be a Pilot</i>	Published	1998
<i>How to Own an Aircraft</i>	Published	1999
<i>How to Charter an Aircraft</i>	Published	1999
<i>How to Navigate the CAA Web site</i>	Published	1999
<i>How to be an Aircraft Maintenance Engineer</i>	Published	1999

The **GAP (Good Aviation Practice)** series aim to provide the best safety advice possible to pilots. The following titles have been published so far:

<i>Winter Operations</i>	Published	1998
<i>Bird Hazards</i>	Published	1998
<i>Wake Turbulence</i>	Published	1998
<i>Weight and Balance</i>	Published	1998
<i>Mountain Flying</i>	Published	1999
<i>*Flight Instructor's Guide</i>	Published	1999

How To and **GAP** booklets (but not *Flight Instructor's Guide*) are available from most aero clubs, training schools or from Field Safety Advisers (FSA contact details are usually printed in each issue of *Vector*). Note that *How to be a Pilot* is also available from your local high school.

Bulk orders (but not *Flight Instructor's Guide*) can be obtained from:

The Safety Education and Publishing Unit

Civil Aviation Authority
P O Box 31-441, Lower Hutt
Phone 0-4-560 9400

*The *Flight Instructor's Guide* is sold by two suppliers, details of whom can be found in the item to the above right.

How to be an Aircraft Maintenance Engineer

Aircraft maintenance is an exciting and challenging field, which demands perseverance and dedication from its players. There are several different ways to enter the world of the aircraft maintenance engineer, all of which are covered in the CAA's latest *How to* booklet. This twelve-page booklet is designed to assist those who might be considering making aircraft maintenance a career. *How to be an Aircraft Maintenance Engineer* will help the reader to discover which path is best for them based on their experience, financial position, interests, and qualifications. Copies have been sent out to secondary schools, flying schools, and aerodromes throughout the country, but they may also be obtained through the local Field Safety Adviser or by contacting the Safety Education and Publishing Unit.



New Suppliers for Flight Instructor's Guide

The *Flight Instructor's Guide* now has new suppliers, following the Design and Copy Centre going into liquidation. The new suppliers are listed alphabetically at the end of this item.

Colour OHP transparencies of lesson briefings are also available from these suppliers. Note that the briefings are intended as a guide only. Some have a large amount of information compressed into one A4 transparency, in which case it may be preferable to transfer part of the briefing to a second transparency for effectiveness of delivery. And there's always the whiteboard!

The cost of the *Flight Instructor's Guide* has increased; the previous supplier was offering them at below true cost.

- **Expo Digital Document Centre**
P O Box 30-716, Lower Hutt.
Tel: 0-4-569 7788, Fax: 0-4-569 2424,
Email: expohutt@expo.co.nz
- **The Colour Guy**
P O Box 30-464, Lower Hutt.
Tel: 0800 201 200, Fax 0-4-570 1299,
Email: orders@colourguy.co.nz

Field Safety Advisers

- John Fogden**
(North Island, north of line, and including, New Plymouth-Taupo-East Cape)
Ph: 0-9-425 0072 Fax: 0-9-425 7945
Mobile: 025-852 096 email: fogdenj@caa.govt.nz
- Ross St George**
(North Island, south of line, and including, New Plymouth-Taupo-East Cape)
Ph: 0-6-353 7443 Fax: 0-6-353 3374
Mobile: 025-852 097 email: stgeorger@caa.govt.nz
- Murray Fowler**
(South Island)
Ph: 0-3-349 8687 Fax: 0-3-349 5851
Mobile: 025-852 098 email: fowlerm@caa.govt.nz
- Owen Walker**
(Maintenance, New Zealand-wide)
Ph: 0-7-866 0236 Fax: 0-7-866 0235
Mobile: 025-244 1425 email: walkero@caa.govt.nz

Publications

0800 GET RULES — (0800 438 785) for CA Rules, ACs, CAA (saleable) Forms, CAA Logbooks, Part 39 Airworthiness Directives, and copies of the *Flight Instructor's Guide*.

CAA Web Site, <http://www.caa.govt.nz> for CA Rules, ACs and Airworthiness Directives.

0800 500 045 — Aviation Publishing, for AIP documents, including Planning Manual, IFG, VFG, SPFG, VTCs, and other maps and charts.

Accident Notification

24-hour 7-day toll-free telephone

0508 ACCIDENT
(0508 222 433)

CAA Act requires notification
"as soon as practicable".

Occurrence BRIEFS

The content of "Occurrence Briefs" comprises all notified aircraft accidents, GA defect incidents (submitted by the aviation industry to the CAA), and selected foreign occurrences that we believe will most benefit engineers and operators. Statistical analyses of occurrences will normally be published in *CAA News*.

Individual Accident Reports (but not GA Defect Incidents) – as reported in "Occurrence Briefs" – are now accessible on the Internet at CAA's web site (<http://www.caa.govt.nz/>). These include all those that have been published in "Occurrence Briefs", and some that have been released but not yet published. (Note that "Occurrence Briefs" and the web site are limited only to those accidents which have occurred since 1 January 1996.)

Accidents

The pilot in command of an aircraft involved in an accident is required by the Civil Aviation Act to notify the Civil Aviation Authority "as soon as practicable", unless prevented by injury, in which case responsibility falls on the aircraft operator. The CAA has a dedicated telephone number 0508 ACCIDENT (0508 222 433) for this purpose. Follow-up details of accidents should normally be submitted on Form CAA 005 to the CAA Safety Investigation and Analysis Group.

Some accidents are investigated by the Transport Accident Investigation Commission, and it is the CAA's responsibility to notify TAIC of all accidents. The reports which follow are the results of either CAA or TAIC investigations.

ZK-DKL, Cessna 177B, 14 Sep 98 at 1152, nr Mt Cook. 3 POB, injuries 3 fatal, aircraft destroyed. Nature of flight, transport passenger A to B. Pilot CAA licence CPL (Aeroplane), age 29 yrs, flying hours 1306 total, 80 on type, 68 in last 90 days.

On Monday 14 September 1998 at about 1152 hours, ZK-DKL, a Cessna 177B Cardinal on an air transport scenic flight across the Mount Cook region struck a snow-covered mountain face 11 kilometres northeast of Mount Cook.

The pilot and two passengers died as a result of the impact.

The aircraft probably encountered a strong laminar downdraught before entering a thin cloud layer before impact. Although ample escape options were available to the pilot to turn ZK-DKL away from the rising terrain and cloud ahead, he did not make a timely decision to do so. Why the pilot did not make a timely turn away could not be explained.

The pilot might have persevered for too long expecting to encounter an updraught, or some distraction could have diverted the pilot's attention from the safe operation of the aircraft, which prevented him from recognising that ZK-DKL was descending quickly toward the cloud layer and mountainous terrain until shortly before the aircraft entered cloud.

Alternatively, the pilot might have been unaware of or misjudged the intensity of any downdraught ZK-DKL encountered.

The pilot may have believed he had crossed the Main Divide to the west; consequently once ZK-DKL entered the cloud he most likely elected to go on in order to break out of the cloud, as he knew the conditions were clear ahead on the west coast.

The cause of the accident was not established.

Main sources of information: Abstract from TAIC Accident Report 98-009. Note that the preliminary TAIC Accident Report abstract was inadvertently published in the previous issue of *VECTOR*, and that the above synopsis has been taken from the final TAIC Accident Report to rectify this error.

CAA Occurrence Ref 98/2511

ZK-GNJ, Rolladen-Schneider LS 4, 18 Nov 98 at 1516, Omarama. 1 POB, injuries 1 minor, aircraft destroyed. Nature of flight, private other. Pilot CAA licence nil, age not known, flying hours 1040 total, 16 on type, 65 in last 90 days.

The visiting overseas pilot was taking part in competition flying from Omarama. There had previously been some difficulty with his "fitting in" and he had been relegated to a competition level that was thought to be more compatible with his experience. He acknowledged his lack of mountain flying experience.

While manoeuvring alongside a ridge south of Omarama, the pilot is believed to have performed a chandelle (wing-over) following which a loss of airspeed led to the glider impacting the hillside. The bottom was torn out of the aircraft and the rear fuselage snapped.

Organisers evidently attempted to supervise the pilot's participation in the competition, but the nature of the flying prevented a close watch being kept on him.

Main sources of information: Accident details submitted by pilot plus further enquiries by CAA.

CAA Occurrence Ref 98/3090

ZK-CUI, Piper PA-28R-180, 19 Nov 98 at 1235, Mt Somers. 1 POB, injuries nil, damage substantial. Nature of flight, private other. Pilot CAA licence PPL (Aeroplane), age 52 yrs, flying hours 900 total, 900 on type, 25 in last 90 days.

The pilot was familiar with the private strip near Mt Somers. Before the flight he had enquired about the state of the strip and weather conditions in the area. A rain shower had passed through the landing area, however, while he was en route to the strip. An update was not available before landing. The rain made the grass very slippery and the aircraft over-ran the strip and collided with a fence.

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 98/3186

ZK-EQX, Piper PA-38-112, 26 Nov 98 at 1205, Invercargill. 1 POB, injuries nil, damage substantial. Nature of flight, training solo. Pilot CAA licence nil, age 18 yrs, flying hours 30 total, 30 on type, 1 in last 90 days.

The student pilot was carrying out the fifth in a series of practice forced landings from 3000 feet, initiating each go-around from 500 feet agl. Full power was selected and the engine appeared to respond normally, but after a few seconds it lost power. Trouble checks did not restore power, so an actual forced landing into a swamp was carried out.

The student's use of carburettor heat had been observed on an earlier dual flight that day and was considered to be normal and appropriate. The air temperature was 10 degrees Celsius, and the dew point about one degree Celsius.

Initial inspection did not disclose any fault with either the engine or carburettor.

Main sources of information: Accident details submitted by pilot and operator.

CAA Occurrence Ref 98/3192

ZK-HID, Hiller UH-12E, 6 Dec 98 at 0700, Takapau. 2 POB, injuries nil, damage substantial. Nature of flight, aerial application/dropping. Pilot CAA licence CPL (Helicopter), age 39 yrs, flying hours 830 total, 500 on type, 107 in last 90 days.

The pilot was positioning from one spraying site to another, which was covered by a light layer of fog. The pilot descended into the fog and, on losing forward visibility, decided to descend vertically to the ground. The helicopter developed 'power settling' and landed heavily.

Main sources of information: Accident details submitted by pilot plus further enquiries by CAA.

CAA Occurrence Ref 98/3252

ZK-HQD, Robinson R22 Beta, 11 Dec 98 at 1040, 33 SSE Whakatane. 2 POB, injuries nil, damage substantial. Nature of flight, training dual. Pilot CAA licence CPL (Helicopter), age 44 yrs, flying hours 553 total, 530 on type, 22 in last 90 days.

The helicopter was making an approach to a confined area, with the student on the controls. There was a light downwind component, and as translational lift was lost, an increased rate of descent was encountered. The student did not correct for this immediately, resulting in an excessive collective pitch application. Rotor rpm decayed, and although the instructor took over, he was unable to prevent the helicopter from landing heavily and rolling on to its left side.

Main sources of information: Accident details submitted by pilot plus further enquiries by CAA.

CAA Occurrence Ref 98/3358

ZK-GTG, Schempp-Hirth Janus B, 12 Dec 98 at 1450, Tauranga. 2 POB, injuries nil, damage substantial. Nature of flight, training dual. Pilot CAA licence nil, age not known, flying hours 208 total, 91 on type, 4 in last 90 days.

The glider undershot on approach to runway 21 at Tauranga, clipping the boundary fence and damaging its right wing. A wind gradient and sink were present at the time, but their effects were greater than anticipated by the instructor.

Main sources of information: Accident details submitted by pilot plus further enquiries by CAA.

CAA Occurrence Ref 98/3360

ZK-GEX, Schleicher Ka 6CR, 20 Dec 98 at 1240, Paraparaumu. 1 POB, injuries nil, aircraft destroyed. Nature of flight, private other. Pilot CAA licence nil, age 87 yrs, flying hours 474 total, 180 on type, 0 in last 90 days.

The glider was on a local flight in gusty northwest wind conditions with an 1100-foot cloud ceiling. The pilot was unable to find lift before being committed to return to the aerodrome, and initially aimed to approach on grass 29. He decided that, however, a landing on grass 34 was feasible, but while positioning for that vector, it became apparent that insufficient height was available. A field south of the aerodrome was selected, and the pilot carried out a low 360-degree turn to line up with it. Touchdown speed was excessive, and the glider landed heavily. The left wing was torn off when it impacted with tall rushes.

Lack of recent flying experience was a factor in this accident.

Main sources of information: Accident details submitted by pilot plus further enquiries by CAA.

CAA Occurrence Ref 98/3407

ZK-WLG, Cessna 421C, 23 Dec 98 at 1350, Great Barrier. 6 POB, injuries nil, damage minor. Nature of flight, private other. Pilot CAA licence CPL (Aeroplane), age 29 yrs, flying hours 886 total, 83 on type, 50 in last 90 days.

The aircraft suffered a propeller strike on landing, following a heavy touchdown on the righthand main undercarriage. All three blade tips on the starboard propeller were bent back and there was stress damage to the wing and fuselage.

Main sources of information: Accident details submitted by pilot plus further CAA enquires and engineering investigation.

CAA Occurrence Ref 98/3467

ZK-CDY, Cessna 180A, 27 Dec 98 at 1045, Cheviot. 2 POB, injuries nil, damage substantial. Nature of flight, private other. Pilot CAA licence PPL (Aeroplane), age 76 yrs, flying hours 2280 total, 649 on type, 21 in last 90 days.

The pilot reported that he had lost control of the aircraft while taking off from his farm strip. A marked swing to the left developed and the aircraft did not respond well to the pilot's control inputs. The aircraft departed the lefthand side of the strip and descended into a shallow gully, still with takeoff power set. Barely airborne, it followed the contour until the right undercarriage leg failed and folded under its belly. Power was reduced, but the aircraft continued a sharp into-wind turn, impacting upsloping ground, which caused the right wing to fold up outboard of the flap. The aircraft came to rest approximately 100 metres to the left, and 50 feet below, the strip on a reciprocal heading.

The strip was of adequate width and length, and the wind was approximately five knots from the right-rear quarter at the time of the accident. Examination of the aircraft's tyre tracks showed that the takeoff roll had been commenced from the righthand side of the strip where a marked camber existed. The pilot was aware of the right wing being low, but the passenger seated on the right was not, possibly because the ground fell away to the right at that point. The camber would have contributed to the left swing as the aircraft attempted to turn into the slope under the effect of the centre of gravity. This may have been at the same time as the pilot applied left brake and rudder to make the required heading adjustment. Inspection of the aircraft by maintenance engineers found no mechanical

factor that would have caused, or contributed to, the swing. Abandoning the takeoff at the point where a loss of directional control was apparent may have avoided any damage. The pilot, however, felt that the swing happened too quickly, and thought that once airborne he may have been able to fly down the gully and climb away.

Main sources of information: Accident details submitted by pilot and operator plus further enquiries by CAA.

CAA Occurrence Ref 98/3449

ZK-GSN, PZL-Swidnik PW-5 "Smyk", 29 Dec 98 at 1500, Matamata. 1 POB, injuries nil, damage substantial. Nature of flight, private other. Pilot CAA licence nil, age not known, flying hours 51 total, 0 on type, 0 in last 90 days.

The pilot had been thermalling 3 to 4 kilometres north of the airfield, and decided to terminate the flight when he reached 1500 feet. On approach, he recognised that he had insufficient altitude to return to the aerodrome. The pilot decided to land

in a field near the aerodrome, but the glider struck a previously unseen fence.

Main sources of information: Accident details submitted by pilot plus further enquiries by CAA.

CAA Occurrence Ref 98/3464

ZK-GMJ, PZL-Bielsko SZD-48-1 Jantar Standard 2, 1 Jan 99 at 1620, Masterton. 1 POB, injuries nil, damage substantial. Nature of flight, private other. Pilot CAA licence nil, age 46 yrs, flying hours 808 total, 300 on type, 46 in last 90 days.

The glider was on a contest task, when the pilot attempted to land at Masterton with an insufficient height margin to compensate for a wind shift on final approach. The aircraft landed 40 metres short of the boundary fence, and the tail section struck the fence when the pilot deliberately attempted a groundloop.

Main sources of information: Accident details submitted by pilot plus further enquiries by CAA.

CAA Occurrence Ref 99/3

GA Defect Incidents

The reports and recommendations which follow are based on details submitted mainly by Licensed Aircraft Maintenance Engineers on behalf of operators, in accordance with Civil Aviation Rule, Part 12 *Accidents, Incidents, and Statistics*. They relate only to aircraft of maximum certificated takeoff weight of 5700 kg or less. Details of defects should normally be submitted on Form CAA 005 to the CAA Safety Investigation and Analysis Group.

The CAA Occurrence Number at the end of each report should be quoted in any enquiries.

Aerospatiale AS 355F1

Number two nozzle diaphragm detaches

Approximately 10 minutes from landing at Queenstown Aerodrome the pilot observed an engine chip light indication for the number two engine. A decision was made to reduce power and continue the flight. The chip detector was subsequently inspected by engineers and found to be functioning normally, however, when an attempt was made to start the engine it was found to have seized.

Further investigation revealed that the number two nozzle diaphragm had become detached from the vane assembly casting (possibly due to cracking) and had contacted the GP rotor assembly causing it to become seriously deformed and lodge itself between the number two vane assembly and the GP rotor.

ATA 7250

CAA Occurrence Ref 98/1414

Bell 206B

M/R pitch link corrodes, P/N 206-010-360-003

During a routine inspection a data plate was found to be missing from one main rotor pitch control link P/N 206-010-360-003. A ridge of hard brittle bonding material outlined the shape of where the plate had been.

Further investigation revealed that the tag had become detached due to surface corrosion under the data plate. The corrosion was, however, within limits. It was determined that primer paint had not been applied during the manufacturing process and the reporter was concerned that stress corrosion could have developed. The manufacturer has since been informed and an Airworthiness Directive issued to require corrosion inspections of data plates.

ATA 6200

CAA Occurrence Ref 98/70

Bell 206L-3

Tail boom frame cracks, P/N 206-032-308-103

During a 100-hour maintenance inspection the frame where the tail boom attaches to the helicopter body was found to be cracked.

The cause of the defect was not determined. TTIS 934 hours; TSI 50 hrs.

ATA 5310

CAA Occurrence Ref 98/227

Cessna 152

Fuel line corrodes

During the pilot's pre-flight checks the carpet on the righthand side of the cockpit was found to be soaked in fuel.

Further inspection revealed that corrosion had caused pitting in the fuel line by the door sill, which resulted in a pinhole developing. This occurred even though this particular section of fuel pipe is sleeved. The fuel line was replaced, and because this was a repeat problem it is intended that it will be painted at the next maintenance visit.

ATA 2820

CAA Occurrence Ref 98/1919

Cessna A152

Carburettor seal disintegrates

Just after getting airborne the pilot requested a priority landing due to the engine running roughly. Rescue Fire Service was advised of situation, but the aircraft landed safely.

Investigation revealed that part of the carburettor heat butterfly seal was missing and the remainder of the seal was very loose. It is thought that the piece of missing seal may have caused a partial blockage of the induction system causing the engine power loss and surging.

ATA 8500

CAA Occurrence Ref 98/768

International Occurrences

Lessons from aviation experience cross international boundaries. In this section, we bring to your attention items from abroad which we believe could be relevant to New Zealand operations.

Australia

Occurrences

The following occurrences come from the August 1996 edition of *Asia Pacific Air Safety* that is published by the Bureau of Air Safety Investigation (BASI), Australia.

Cessna 210K – Aircraft jumps chock after pilot hand-swings propeller

The pilot attempted to start the engine for the return flight to Darwin, but the starter motor failed to operate. He then applied the handbrake, chocked the nosewheel and hand-swung the propeller. After several attempts the engine fired then ran at a high rpm, causing the aircraft to jump over the chock and head towards the airport fence.

After unsuccessfully attempting to enter the cabin, the pilot tried to grab a mainwheel, but missed. He next grabbed at the tailplane but was knocked to the ground. The empty aircraft then ran through the airport fence, across a road and into a ditch, where it came to rest suffering substantial damage.

Cessna 172P – Pilot loses directional control during takeoff

The pilot reported that she had planned to carry out a daylight circuit followed by night circuit practice. As the pilot applied full power and commenced the takeoff roll from the threshold of runway 18, the aircraft veered off the runway to the left, collided with an earth bank and overturned.

The pilot had very limited recent experience, and none of it was in the accident aircraft. The aircraft had recently been fitted with a 180-hp engine. Consequently, the torque effect was greater than normal for this type of aircraft.

When the aircraft started to veer left, the pilot attempted to correct it by using a limited amount of right rudder and right aileron. This action had little or no initial effect.

A witness, and an inspection of the ground marks, indicated that as the aircraft approached the edge of the runway the aileron took effect and the left wing came up. The aircraft then ran along the ground on its right wheel only.

The aircraft left the runway, ran across the dirt flight strip, up an embankment that was outside the flight strip, and overturned. The pilot did not close the throttle until the aircraft was about to overturn.

A post-accident inspection of the aircraft failed to disclose any defects in the aircraft brakes or controls.

It is probable that the pilot, who lacked recency, was not anticipating the increased torque effect of the new, more powerful engine. The action that she took to correct the yaw that accompanied the application of power was insufficient to prevent the aircraft veering off the runway. She then lost directional control completely as the left wing lifted, leaving only the right wheel in contact with the ground. Had the throttle been closed earlier, the aircraft may have been brought to a stop before substantial damage was incurred.

United Kingdom

Occurrences

The following occurrences come from the March 1999 edition of *Flight Safety, Fixed-Wing Occurrence Lists*, published by the Safety Data Department, United Kingdom CAA.

Embraer 145 (Banderiante) – Flight director fails to follow localiser

During a VMC approach with the autopilot engaged and established on the localiser, the aircraft drifted slowly to the right of the centreline. The flight director was slow to respond, resulting in further deviations both left and right of the centreline. The autopilot was disconnected and the remainder of the approach flown manually without any further problems.

There was no adverse weather apparent at the time of the incident.

SDD Occurrence No 9901168J

SAAB-F 340 – Aircraft veers off runway

The aircraft veered off the runway onto the grass while taking off in gusty wind conditions.

Investigations found that the pilot was aware of the aircraft drifting to the right of the centreline during the takeoff run, and had progressively applied left rudder pressure until maximum deflection was reached. The aircraft still, however, continued to drift to the right until it left the runway.

It was concluded that the uncommanded right tracking was probably due to a combination of strong gusty wind, inappropriate control inputs, and possibly some sort of nosewheel misalignment. The wind was probably gusting above the aircraft's maximum allowable crosswind limitation and, with inappropriate rudder input, the pilot would have required additional nosewheel steering to maintain the runway centreline. The nosewheel angle may have been beyond the normal free-castering limit; it is also possible that a post-incident anomaly found in the nosewheel steering may have locked the nosewheel at an angle within the normal free-castering limit. In either situation, the locked nosewheel would have produced a very strong yawing moment to the right.

SDD Occurrence No 9800871D

GA Fatal Accidents

Piper PA31-350 – Both engines fail

Both engines lost power during a ferry flight from Tangiers to Guernsey. The pilot ditched the aircraft into the sea but did not survive.

Investigations identified that the pilot had not made the appropriate allowance for adverse headwind components before or during the flight, was not carrying sufficient fuel for the flight, and apparently ignored pre-flight and in-flight indications that he should land and refuel. The investigation also found that the pilot's chances of survival were adversely affected by not adopting the optimum configuration and heading for ditching.

SDD Occurrence No 9803223B