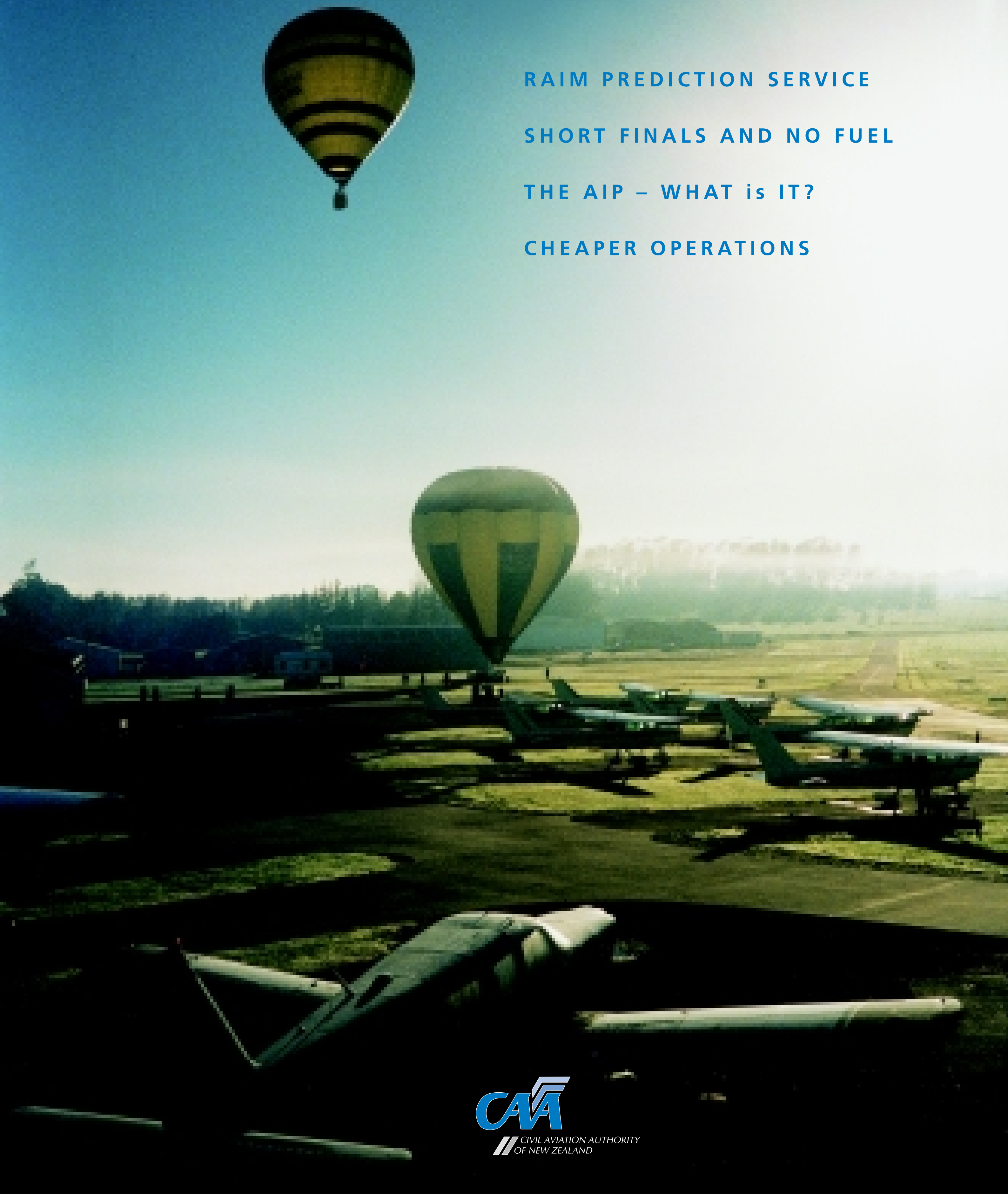
September/October 1999, Issue 6

VECTOR

Pointing to Safer Aviation



RAIM PREDICTION SERVICE

SHORT FINALS AND NO FUEL

THE AIP – WHAT is IT?

CHEAPER OPERATIONS

CAA
CIVIL AVIATION AUTHORITY
OF NEW ZEALAND

VECTOR

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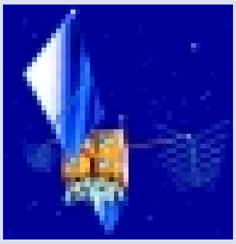
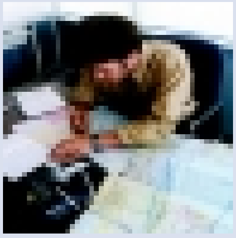


Sometimes there are insufficient satellites in view to provide an integrity check for pilots relying on GPS for navigation. This article explains what Receiver Autonomous Integrity Monitoring (RAIM) is and how the new RAIM prediction service works.



The AIP is made up of nine different products, which are essential to flight safety. Do you know what they are?

The CAA has just designated three new military low flying zones that you should know about. Details and diagrams are contained within.

We all know that you have to spend money to make money! So why not make an investment now in a safety programme that is going increase your long-term profits? It makes good business sense – read on to find out more.

Sometimes small oversights in the flight-planning phase can compound to result in a serious incident or accident. Find out what happened to this particular pilot.

Using your cellphone to obtain a pre-flight briefing and then file a flight plan/ SARWATCH may not always be the best option. This *FAA News* article explains why.

Also Featuring:

Cover Photo:

An early morning winter scene at North Shore aerodrome as local balloon operators make an intermediate landing during a morning champagne flight. North Shore Aero Club President, Carole Dennis, captured the moment on a club camera kept handy for opportunities like this.

Safety Seminars

Cross-Country Seminars

This year's series of safety seminars is well under way and have proven very popular so far, with large numbers attending.

The seminars revolve around the planning and decision-making involved in making a VFR cross-country flight. At North Island seminars pilots will be tasked with flying south to Warbirds Over Wanaka, and at South Island venues pilots will plan a flight north to the America's Cup. Most aspects of planning and executing such a flight will be covered, with particular emphasis on airspace considerations, understanding local weather patterns, avoiding inhospitable terrain, mountain flying considerations where applicable, and interpreting AIP Supplements and NOTAMs.

Experienced instructors will provide you with useful tips about operating in their part of the country, and CAA staff will cover various aspects of the planning and decision-making involved in a cross-country flight.

Whether you have five hours or five thousand hours, these seminars will be of value to you – particularly if you don't fly 'across the ditch' very often.

There are six Av-Kiwi Seminars scheduled to run from mid through to late October. Check the accompanying list for venue and date details, and watch out for advertising posters displayed at your local training organisation or aviation business. These seminars are enjoyable, informative, and popular – so see you at one soon!

Seminar Schedule

Thu 14 October, 7:00 pm – 10:00 pm

New Plymouth Aerodrome, at New Plymouth Aero Club.

Sat 16 October, 9:30 am – 12:30 pm

Ohakea, Educational Unit Theatrette. (*See note below).

Sun 17 October, 9:30 am – 12:30 pm

Paraparaumu Aerodrome, at Associated Aviation.

Tue 19 October, 7:00 pm – 10:00 pm

Omaka Aerodrome, at Marlborough Aero Club.

Wed 20 October, 7:00 pm – 10:00 pm

Nelson, Tahuna Function Centre, Beach Road, Tahuna.

Thu 21 October, 7:00 pm – 10:00 pm

Greymouth Aerodrome, at Greymouth Aero Club.

*Note that it will be possible to fly in to the Ohakea seminar provided that you advise your aircraft type, registration, and ETA to Base Operations (Phone 0–6–351 5442 or Fax 0–6–351 5448) by midday Friday 15 October 1999. This offer is open only to those wishing to attend the Av-Kiwi seminar. If driving in, visitor passes and directions will be available at the main gate. A visit to ATC may be possible immediately following the seminar. Kites Café will be open for lunch.

Maintenance Seminars

Two safety seminars on maintenance are planned for Pine Park and Dargaville in October of this year. These will focus on last year's topic, *Maintenance Matters*, and are particularly pertinent to aircraft owners/operators and pilots.

Achieving a high standard of maintenance is a function of good plant, good planning and good decisions. These seminars look at the ingredients to assist this and highlight the relationships that exist between engineer, owner, operator and pilot to achieve serviceability and safety. The roles and responsibilities of all parties under the relevant CAA rules are also explored in some detail.

The seminars will be presented by Owen Walker, CAA Field Safety Adviser (Maintenance). Venue details and dates are outlined below:

Sat 2 October, 9:00 am – 12:00 pm

Dargaville Aerodrome, at Northern Wairoa Aero Club.

Sat 30 October, 9:30 am – 12:30 pm

Pine Park Aerodrome, at Pine Park Aero Club.

RAIM Prediction Service

Receiver Autonomous Integrity Monitoring (RAIM) is an important function for checking GPS navigation integrity. On occasions there are insufficient GPS satellites in view to provide an integrity check using the RAIM function. Such gaps in coverage, or 'RAIM holes', need to be known in advance when pilots are relying on GPS navigation. This article, compiled by Rudi Van der Velden (Navigation Engineering Development) of Airways Corporation of New Zealand, explains what RAIM is and how the new RAIM prediction service works.

This article is technical by its very nature and is therefore awash with acronyms, which are necessary to ensure its readability. We have listed the majority of these below as a handy reference:

AFTN	– Aeronautical Fixed Telecommunication Network
DoD	– US Department of Defense
GBAS	– Ground Based Augmentation System
GLONASS	– Global Navigation Satellite System
GNSS	– Global Navigation Satellite System
NPA	– Non-Precision Approach
RAIM	– Receiver Autonomous Integrity Monitoring
RPS	– RAIM Prediction System
SBAS	– Space Based Augmentation System
TSO	– Technical Safety Order

RAIM Prediction Service

Airways Corporation has recently signed a contract with AirServices Australia (ASA) to provide RAIM prediction information from their RAIM Prediction System (RPS). This was a more cost-effective approach than developing our own system here in New Zealand, since we only needed to supply ASA with a database of selected New Zealand airfields.

The purpose of the RPS is to provide aerodrome specific GPS RAIM outages to pilots during the pre-flight planning process. It can also be used to notify Air Traffic Control, via the AFTN (Aeronautical Fixed Telecommunications Network), of these outages. RPS can provide up to 72 hours of GPS outage predictions. The service is provided by Airways Corporation free-of-charge to users and can be accessed via either the AFTN or the Internet.

RPS has been on trial for the past year in New Zealand and has provided significant information on the occurrence of RAIM outages around the country.

How RAIM Works

RAIM provides navigational integrity by detecting if a GPS satellite has failed or is sending an invalid message. It is a software function available in IFR-certified GPS receivers that compares position and time information from combinations of any four out of five or more satellites. Occasionally there are insufficient satellites in view to provide a GPS integrity assurance using the RAIM function. This may mean that GPS accuracy is outside the requirements considered safe for navigation.

RAIM prediction systems offer advance warning of GPS position information integrity at specific locations. During pre-flight planning such warnings can be useful if the user is intending to use GPS as a primary navigation tool (provided all CAA rule requirements are met under Part 19 *Transition Rules*) and in particular when used for non-precision approaches.

RAIM holes can exist for periods of 30 or more minutes at certain locations. Being aware of these in advance can offer fuel savings by delaying departure times so as to arrive at the desired destination when sufficient satellites are in view.

Accessing RPS Information

Internet

The Internet is the easiest method of obtaining RPS information providing you have a PC and Internet access. This information can be found at **http://www.airservices.gov.au** and can be accessed as follows:

1. Select Pilot Briefing
2. Select GPS RAIM Availability – New Zealand
3. Select the aerodromes you wish to receive a RAIM availability prediction for
4. Submit your request

AFTN

For those that who do not have access to the Internet, RAIM availability information is also distributed using the AFTN. RAIM messages are available on request, and they are also sent to the National Briefing Office once a day at 1400 UTC, or when there is a change to the constellation status. Up to 20 locations may be included in one request message.

For example, a pilot requesting RAIM information for Milford and Kaitaia, as above, could receive the following reply:

```
NZMF
  NO GPS RAIM OUTAGES
NZKT
  9906092303 TIL 9906092323
  GPS RAIM UNAVBL FOR NPA.
```

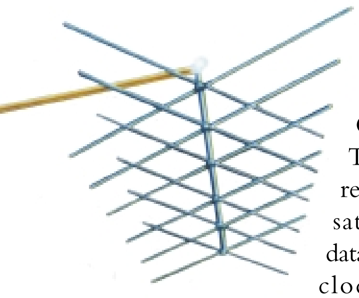
This means there are no RAIM outages for Milford, but there is a predicted RAIM outage for Kaitaia on 9 June 1999 from 2303 to 2323 UTC, ie, for 20 minutes, during which GPS is not available for non-precision approaches.

Similar messages are also received when requests are made via the Internet.

GPS Receivers

RAIM prediction is also available from IFR-certified GPS receivers; it provides a determination of the number of satellites available over a particular location at a specific time. Using this data, and the RAIM algorithm, the GPS receiver will provide an indication of whether using GPS as a primary means of navigation throughout the flight is possible.

A limitation of GPS receivers that have RAIM prediction capability is that they do not take into account forced satellite outages. Occasionallythe US Department of Defense (DoD) needs to do maintenance on GPS satellites. This includes possible re-align-ment of the satellites, uploading data, and adjustments to clock data. DoD provides GPS NOTAMs when-ever there is a scheduled maintenance outage for a GPS satellite.



Aircraft GPS receivers capable of carrying out RAIM predictions may not always remove satellites that are unavailable, since they only consider almanac data (which provides information on approximate positions for active satellites). They may consider that a satellite is available when in fact it may have been taken out for maintenance.

Ground-Based Systems

The RPS that Airways Corporation provides in conjunction with Airservices Australia is located at Brisbane Airport.

The RPS RAIM algorithm used is based on the same requirements as the RAIM algorithm that is contained in an aircraft GPS receiver.

In order for the GPS RPS to compute RAIM availability, it must first download the satellite almanac data. It does this either from a GPS receiver or from a web site maintained by the United States Coast Guard. The almanac data provides the precise position of all orbiting satellites. This data is downloaded at least once a day. GPS NOTAMs of scheduled and unscheduled outages are received via the AFTN as notified by DoD.

Both the almanac and GPS NOTAM data are required by the RPS to generate GPS outage data. RAIM outage information for the aerodromes listed on the database are computed once a day, or whenever a satellite outage NOTAM has been received.

RAIM Coverage in New Zealand

The RPS predicts, up to 72 hours in advance, any RAIM holes at an aerodrome listed on the database. Analysis of the information provided by the RPS has revealed that a number of RAIM holes exist from time to time around New Zealand. There are regular RAIM outages towards the north of the North Island, although these are generally of short duration lasting less than 10 minutes. There have also been instances where RAIM outages have exceeded 30 minutes at some aerodromes.

Examples of the extent to which RAIM outages have occurred are given in Tables 1 to 3.

The predicted RAIM outages from 16 to 29 November 1998 shown in Table 1, and 1 to 14 December 1998 in Table 2, revealed a large number of outages around the country. Table 2 showed large outages (more than 25 mins) on 1, 2 and 3 December for nearly all of the country starting at about the same time. The times given in each cell indicate when the outage occurred. An asterisk indicates there was more than one outage during the day but only where the longest outage was noted. For example, NZKT – 1625* means that more than one outage occurred on 1 December but the longest outage started at 1625 and lasted more than 25 minutes at Kaitaia.

Currently, only the aerodromes listed in the above tables have been provided for on the AirServices Australia RPS database. Further aerodromes will be added in future if required.

RPS Use and Limitations

Anyone who uses GPS extensively should consider using the RAIM prediction facility – especially those who use GPS for non-precision approaches. A number of non-precision approach procedures are now in place, although mainly for emergency service helicopter operations.

Continued over...

Outages : <10mins | 10-15mins | 15-20mins | 20-25mins | >25 mins

JDAY:	306	307	308	309	310	311	312	313	314	315	316	317	318	319
Date:	1	2	3	4	5	6	7	8	9	10	11	12	13	14
NZKT														
NZJI	1448	1444	1440	1435	1432	1428	1424	1420	1415	1411	1407	1403	1359	1355
NZWR										1410	1406	1401	1357	1353
NZJE	1447	1443	1439	1435	1431	1427	1423	1419	1414	1410	1406	1402	1358	1354
NZGB	0617	0614	0610			0600								
NZWT														
NZAA														
NZAR														
NZTO														
NZAP														
NZMQ														
NZHA														
NZHS														
NZWU														
NZOH														
NZPP														
NZMS														
NZNS			0350											
NZWN														
NZWB														
NZWS			0349											
NZKI														
NZGM			0351											
NZCH														
NZCI														
NZMF			0355											
NZQN			0358											
NZDN														
NZNV														

Table 1. RAIM availability 16 to 30 November 1998

...continued from previous page

Outages: <10mins | 10-15mins | 15-20mins | 20-25mins | >25 mins

JDAY:	335	336	337	338	339	340	341	342	343	344	345	346	347	348
Date:	1	2	3	4	5	6	7	8	9	10	11	12	13	14
NZKT	1625 *	1932 *	1617 *		1207				1153 *					1914
NZJI	1626 *	1913 *	1617 *	1233	1208	1225	1221	1216	1154 *	1208	1208	1200	1156	1152 *
NZWR	1626 *	1915 *	1618 *	1231	1209	1223	1219	1215	1154 *		1207	1159	1154 *	1150 *
NZJE	1626 *	1914 *	1618 *	1232	1208	1224	1220	1215	1154 *	1207	1207	1159	1155 *	1151 *
NZGB	1629 *	1917 *	1620 *		1224				1641 *				1338	1912
NZWT	1628 *	1919 *	1620 *		1222				1927 *				1339	1912
NZAA	1628 *	1918 *	1619 *		1205				1927 *				1337	1911
NZAR	1628 *	1918 *	1620 *		1223				1927 *				1337	1911
NZTO	1630 *	1922 *	1621 *		1218				1922				1340	1911
NZAP	1631 *	1923 *	1622 *		1217				1921				1340 *	1911
NZMQ	1631 *	1629 *	1622 *		1219				1922		0109		1334	1937
NZHA	1631 *	1629 *	1623 *		1218				1921		0109		1335	1936
NZHS	1632 *	1926 *	1624 *		1218				1917				1342 *	
NZWU	1632 *	1923 *	1624 *		1218				1919		0110		1337 *	1937
NZOH	1633 *	1924 *	1624 *		1218				1917		0111		1338 *	1938
NZPP	1634 *	1925 *	1625 *		1219				1916		0113		1338 *	1934
NZMS	1634 *	1926 *	1626 *		1219			0227	1915				1339 *	1937
NZNS	1634 *	1922 *	1625 *		1219				1917		0111		1333 *	1938
NZWN	1634*	1925 *	1626 *		1219			0227	1915				1337 *	1933
NZWB	1634 *	1924 *	1626 *		1219				1916		0114		1335 *	1935
NZWS	1634 *	1633 *	1625 *		1218				1918		0110		1331 *	1942 *
NZKI	1636 *	1636 *	1628 *		1219			0224	1914		0117		1334 *	1936 *
NZGM	1635 *	1635 *	1627 *						1916		0112		1330	1942 *
NZCH	1639 *	1925 *	1630 *					0134	1912		0120		1332 *	1938 *
NZCI	1949	1645 *	1941		1225			0214	1916				1855	1905
NZMF	1640 *	1920 *	1632 *					0134	1014 *		0116		1330 *	1948
NZQN	1945 *	1922	1634 *					0134	1017 *		0119		1330 *	1946
NZDN	1941	1925	1933					0138	1022 *				1330 *	1941 *
NZNV	1942	1923	1933					0138	1021 *				1330 *	1946 *

Table 2. RAIM availability 1 to14 December 1998

Outages: <10mins | 10-15mins | 15-20mins | 20-25mins | >25 mins

JDAY:	121	122	123	124	125	126	127	128	129	130	131	132	133	134
Date:	1	2	3	4	5	6	7	8	9	10	11	12	13	14
NZKT	0226	0222	0218	0214	0210	0205	0201	0157	0153	1748 *	0145	0141	0137	0133
NZJI	0224	0220	0215	0211	0207	0203	0159	0155	0151	0147 *	0143	0139	0135	0131
NZWR	0222	0218	0214	0210	0206	0202	0157	0153	0150	0145 *	0141	0137	0133	0129
NZJE	0223	0219	0214	0210	0206	0202	0158	0154	0150	0146 *	0142	0138	0134	0130
NZGB										1726				
NZWT										1726				
NZAA										1723				
NZAR										1724				
NZTO										1725				
NZAP										1725				
NZMQ										1718				
NZHA										1719				
NZHS										1725				
NZWU										1721				
NZOH										1721				
NZPP										1720				
NZMS										1721				
NZNS										1715				
NZWN										1719				
NZWB										1717				
NZWS										1711				
NZKI										1715				
NZGM										1710				
NZCH										1712				
NZCI										0519 *	0515	0511		
NZMF										1703				
NZQN										1703				
NZDN										1705				
NZNV										1704				

Table 3. RAIM availability 1 to 14 May 1999

RAIM prediction should be carried out as part of the pre-flight planning when GPS is to be used as a primary means of navigation. There is, however, a drawback with the RPS, which lies with the 72-hour prediction default setting. That is, if a prediction is made more than 24 hours in advance, the accuracy of the prediction may be less reliable. This is due to some GPS NOTAMs being cancelled within the 72-hour period, which means previous predictions that have taken these into account are no longer valid. For this reason, a RAIM prediction should be made as close as possible to the intended time of departure using the Airways RPS. Additionally, if you have a TSO-C129 receiver capable of RAIM prediction, then a further prediction should be carried out during flight before arriving at the destination. Since it can take more than 45 minutes for the US Air Force command centre to receive information on an errant GPS satellite, it is prudent that pilots maintain RAIM vigilance.

GPS Receivers and Baro-aiding

The availability of RAIM improves if a GPS receiver incorporates barometric altimeter information. Commonly called baro-aiding, this effectively simulates a satellite located directly overhead the user. Hence, baro-aiding means that the RAIM requirement for five or six satellites is reduced to four or five respectively.

RPS assumes baro-aiding is available when making its calculations. In Australia the calculation is not so much of a problem, as barometric aiding has been mandated for all non-precision GPS approaches. New Zealand, on the other hand, has not mandated barometric aiding. There is some chance, therefore, that the RAIM prediction result is better than what is actually determined by a GPS receiver that does not have baro-aiding.

Consideration is being given to a software switch that would allow baro-aiding to be selected or de-selected when RPS information is requested via the Internet.

It is recommended that pilots who are considering purchasing GPS receivers, or replacing the ones they have, consider models that accept barometric altimeter information, thus significantly improving the RAIM availability.

The Future of RPS

Currently only 29 airfields exist on the New Zealand RPS database. This database will be expanded as airfields or locations with GPS approach procedures are further developed. Requests from other users for additional airfields will be included if they are considered suitable.

The availability and accuracy of GPS satellite information is critical to the integrity of GPS as a navigation aid. RAIM is necessary to ensure this integrity. Future systems, such as Ground and Space Based Augmentation Systems (GBAS and SBAS), will offer an additional means of navigation utilising the Global Navigation Satellite System (GNSS). With GBAS providing precision approach capability, and SBAS providing en-route and non-precision approach capability, these systems will offer improved accuracy, integrity, availability, and continuity for navigation by satellite in the future. They should also reduce the occurrence of RAIM outages.

GNSS incorporates the American DoD GPS as well as the Russian equivalent Global Navigation Satellite System (GLONASS).

Selective Availability (SA), the intentional degradation of the GPS accuracy by DoD, is being considered for removal within the next 10 years. This, together with the introduction of GBAS and SBAS in future, should substantially increase the integrity of satellite navigation and possibly remove the existence of RAIM holes altogether.

Further Information

Further background information on the GPS RAIM Prediction Service may be obtained from the AirServices Australia website at:

http://www.airservices.gov.au/Apps/Briefing/raimdoc.htm

Alternatively contact:

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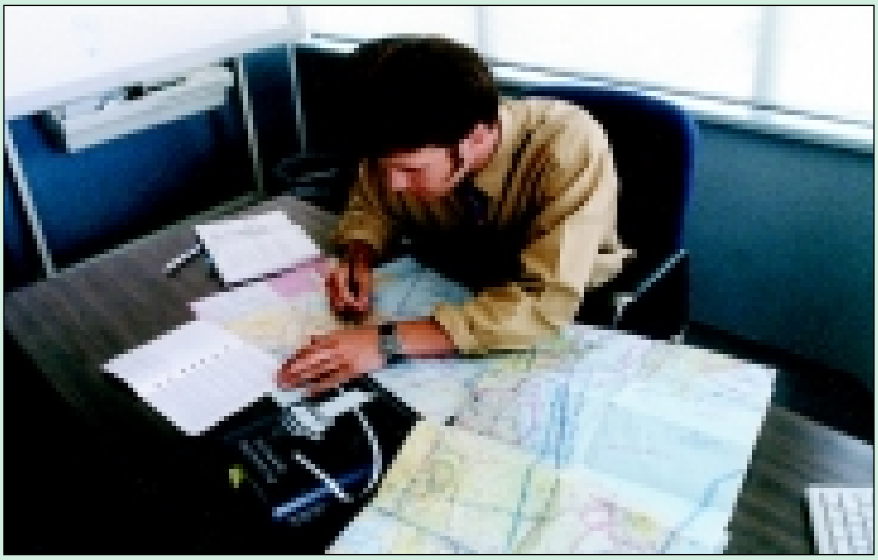
The AIP – What is It?

Most of us are familiar with the Visual Flight Guide (VFG), Topographical Charts, and the Visual Terminal Charts (VTCs), but what about the other products that make up the Aeronautical Information Publication (AIP)? Supplements and VFG Change Notices are products that we should also be familiar with. This article provides a brief description about each product and how it is used.



The AIP forms a major part of the Aeronautical Information Service (AIS). The remainder of this service is comprised of the Pre-flight Information Service, which is provided by the National Briefing Office (NBO) and the NOTAM office. It is the responsibility of each pilot licence holder under the Civil Aviation Rules to ensure that they have up-to-date documents and charts that are appropriate for the type of flying they do.

The AIP contains a vast amount of information that is designed to assist pilots with pre-flight planning and when in the air. Every effort is made by the CAA and the Airways Corporation to keep this information as up-to-date as possible – especially while the transition between the old Civil Aviation Regulations and the new Civil Aviation Rules is taking place. These changes, combined with other changes such as those to airspace and aerodromes, often mean that there is a large volume of amendments to the AIP. For safety reasons, therefore, it is important that these documents are kept up to date.

So what are the various products which make up the AIP?

Visual Flight Guide (VFG)

The VFG provides information and procedures for VFR operations that are land based. It contains information on normal VFR operations, special procedures, emergency procedures, and pictorial information on many of the aerodromes around New Zealand. It is issued annually in June and becomes effective in mid July. A subscription entitles you to one VFG and the annual amendment service of Supplements, VFG Change Notices, and Aeronautical Information Circulars (AICs). If you are a VFR pilot, it is extremely important to have an up-to-date VFG and to always carry it with you in the aircraft, even on a local flight.

Helicopter/Water Aerodrome VFG (HWVFG)

The HWVFG provides information and details on procedures for VFR operations

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into heliports and water aerodromes and is structured in a similar way to the fixed-wing VFG. Issued annually, a subscription entitles you to the same amendment service as the fixed-wing VFG.

VFG Change Notices

VFG Change Notices contain amendments to VFG text and aerodrome charts that are important to flight safety. Change Notices are issued approximately every two months and tend to grow in size as more material is added. The contents of the Change Notice is then incorporated into the next annual edition of the VFG.

Each time you receive a Change Notice it is a good idea to highlight the affected pages in your VFG. The current Change Notice should always be kept with your VFG. The highlighted page of the VFG will remind you to refer to the Change Notice for the updated aerodrome information if you are planning to fly there.

Instrument Flight Guide (IFG)

The IFG provides information and details of procedures (along with Area and Enroute Charts) required for IFR operations. It contains operational data, instrument approach/departure procedures, special operating procedures, and pictorial information on all the aerodromes around the country that have instrument approach/departure procedures.

Amendments to the IFG are issued two-monthly, whereas Area and Enroute Charts are issued annually in June (effective in July). Annual subscriptions to the amendment service include a full Supplement and AIC service. There are often a large number of IFG amendments because of changing instrument procedures, and it is therefore vital that the IFG it is kept up to date.

AIP Supplements

AIP Supplements contain information of a temporary nature that is not deemed urgent enough to issue as a NOTAM, or information that comprises extensive text or graphics. Military exercises, for example, must be published as an AIP Supplement simply because they are too detailed to be published as a NOTAM. Supplements often contain information about temporary airspace such as Temporary Restricted Areas associated with airshows, or Danger Areas where army firing is taking place, for example. Other information might include aerodrome hazards, or the establishment of a Mandatory Broadcast Zone.

AIP Supplements are issued every month and, like all other AIP products, will usually be in your mailbox one month before they become effective. It is important that you always have a current AIP Supplement and that you read it as part of your pre-flight planning **before** venturing out of your local area – it often contains information that will affect your flight – especially in relation to military exercises.

Planning Manual

The AIP Planning Manual provides information for the purposes of pre-flight planning. It provides pilots with information on the various aeronautical services that are available within the Air Navigation system (eg, Air Traffic Services, aeronautical telecommunication services, meteorological information, and aviation security services) and details how best to comply with the general flight operating rules, particularly Part 91 *General Operating and Flight Rules*. The Planning Manual also provides assistance with things such as how to interpret a meteorological forecast, or different types of airspace, and it also contains a great deal of useful flight-planning information. Its easy-to-use tabulation and contents system enables this type of information to be accessed quickly. The Planning Manual is not, however, intended for use in the air.

Amendments to the Planning Manual are issued every two months.

Topographical Charts (1:500,000)

Topographical Charts are specifically designed to assist with VFR navigation and therefore depict a large amount of detailed geographical information such as spot heights, relief shading, and numerous place names. In order to avoid chart clutter, however, they do not depict airspace completely. There are four 1:500,000 topographical sheets, and they are issued annually in June (effective in mid July).

Visual Terminal Charts (VTCs)

VTCs are 1:250,000 scale charts that depict airspace in and around controlled aerodromes. They are critical in helping to separate VFR and IFR traffic. There are two large VTCs that cover the main centres (Auckland/Ohakea and Wellington/Christchurch) and six smaller VTCs that cover the regional centres. They are all issued annually (effective in mid July).

The applicable and up-to-date VTC(s) should **always** be carried in your aircraft – especially if you are planning to operate in airspace that you are not familiar with. We suggest that you always carry the appropriate VTCs and Topographical Charts when operating under IFR, as you may need to make the transition to VFR at any stage during the flight. While the two large VTCs generally cater for the majority of flights, the smaller VTCs are a must if you plan to fly to regional centres such as Gisborne or Queenstown.

Enroute Instrument Charts

Four Enroute Instrument Charts depict IFR routes on both a national and a local scale. They are issued annually (effective in mid July) as part of the IFG amendment service.

The AIRAC Cycle

All amendments to the AIP are issued in accordance with the ICAO (International Civil Aviation Organisation) AIRAC (aeronautical information regulation and control) cycle of effective dates. This process ensures the timely distribution of what is often safety critical information at least 28 days before it becomes effective.

Subscribing to the AIP

All of the AIP products listed above can be obtained from Aviation Publishing (Tel: 0800 500 045) either on a one-off basis or through an annual subscription. A typical annual subscription to the AIP for a private pilot costs around $180 and would include a VFG (with AIP Supplements, Change Notices, and AICs), two Topographical Charts, two large VTCs, and two small VTCs. Note that both Topographical and Visual Terminal Charts can usually be obtained from your local flight training organisation for a competitive price.

Summary

We would like to stress that it is part of the responsibility of being an active pilot to have the relevant up-to-date documents and charts for the type of flying that you do, in order to comply with Part 91 *General Operating and Flight Rules*. While cost is often cited by some pilots as the main barrier to achieving this, it must be put in perspective in relation to the considerable sums that many of us often spend on flying each year. The AIP is critical to flight safety – make sure you do your bit by keeping it up-to-date. ■

Military Low Flying Zones

As a result of the recent CAA review of low flying zones (LFZs), three designated for the purpose of military low flying down to a height of 50 feet agl have been disestablished. This is because Part 91 *General Operating and Flight Rules* of the Civil Aviation Rules does not apply to military aircraft with respect to low flying.

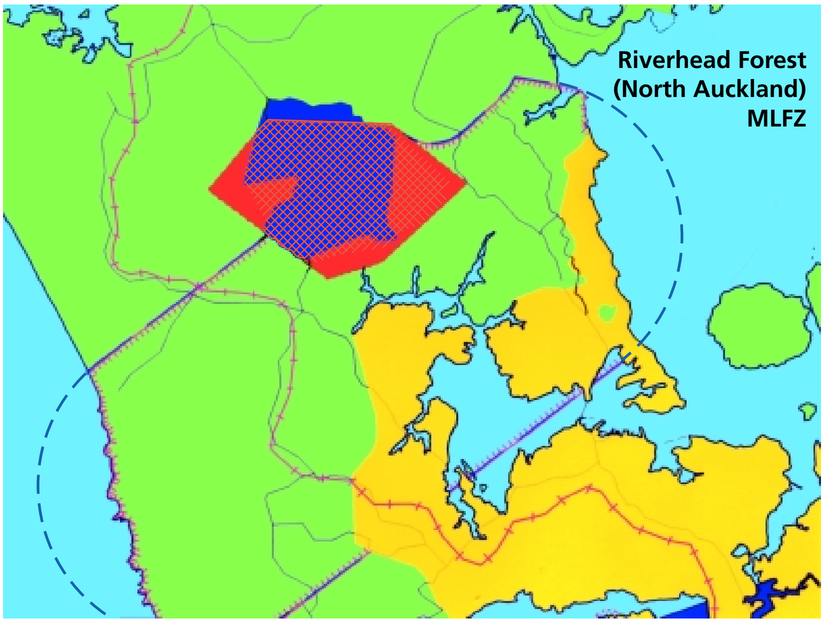
Instead, three military low flying zones (MLFZs) will take their place: Riverhead Forest (North Auckland), Santoft Forest (West Wanganui), and Kaweka-Urewera (Central North Island). These will be illustrated on the applicable aeronautical charts, but civilian pilots should note that they are not available for civil low-flying training, as they are not designated under CAR Part 73 *Special Use Airspace*.

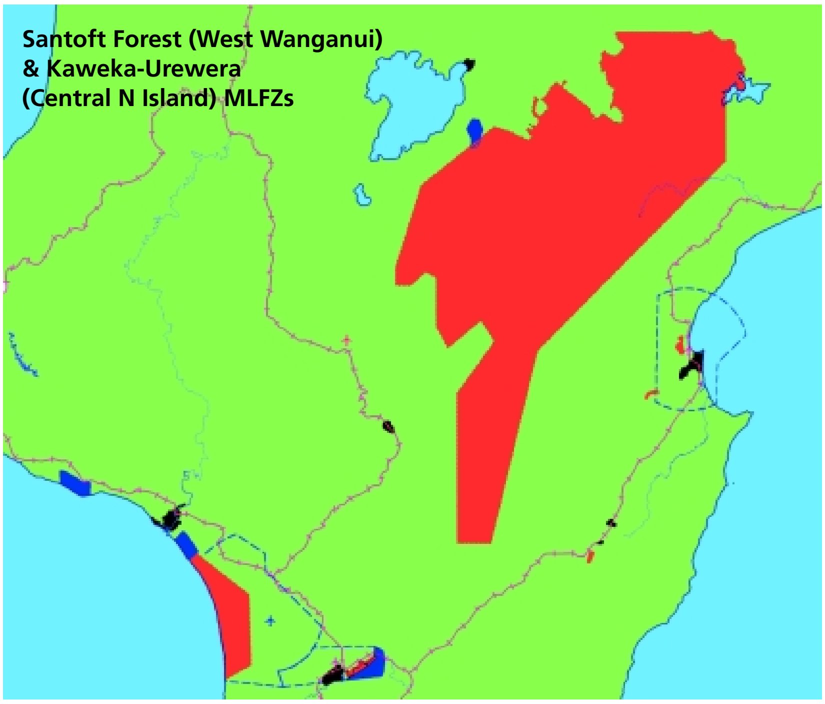
The structure of Riverhead Forest MLFZ is of particular importance to GA pilots. This MLFZ uses the old NZL167 dimensions, but it has a new smaller civil low flying zone (NZL168, Riverhead Forest) contained within it (see accompanying diagram, or the latest Auckland VTC, for details). If you wish to conduct low-flying training within NZL168, you must first contact the Using Agency (Aviation Classics Ltd) to obtain a briefing.

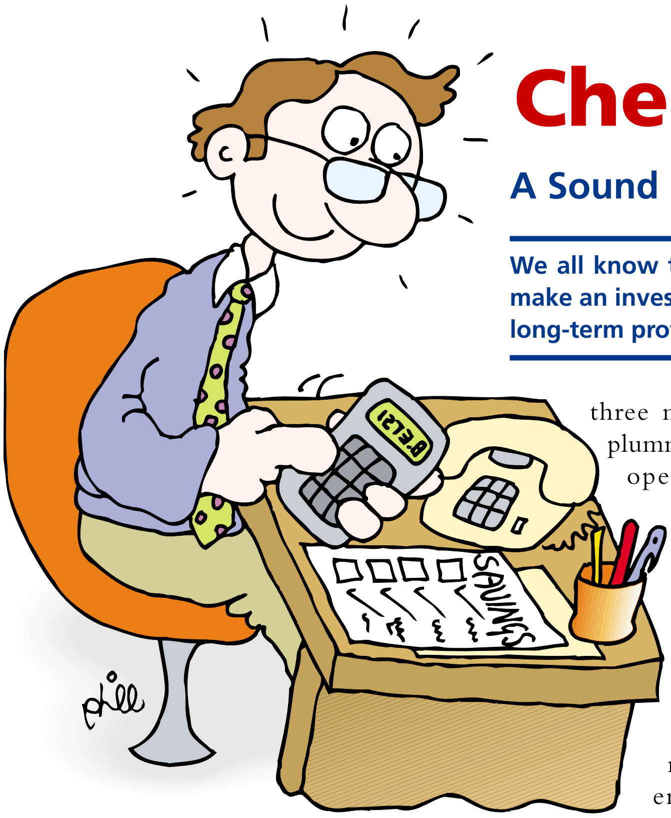
It must be stressed that civil low-flying training can be conducted only within NZL168 and not in the Riverhead Forest MLFZ. Be aware that military aircraft may be operating coincidently within NZL168 down to 50 feet agl, so maintaining a good lookout and listening watch is essential. Refer to the RAC section of the NZAIP *Planning Manual* for Using Agency contact details.

Vector would like to remind pilots that they **must** contact the Using Agency responsible for a particular LFZ to obtain a briefing from a flight instructor before venturing into it. The Using Agency will not be impressed if the land-owners below, or adjacent to, an LFZ withdraw their consent for its use because aircraft are not observing local operating procedures. Bear this in mind when you are next planning a training flight in a LFZ (particularly if it is away from your home base) and, please, 'fly neighbourly' when within a LFZ. ■

Photograph courtesy of RNZAF







Cheaper Operations

A Sound Safety Culture – the Benefits

We all know that you have to spend money to make money! So why not make an investment now in a safety programme that is going increase your long-term profits? It makes good business sense – read on to find out more.

Safety – Costs vs Benefits

A strong safety programme is one that aims to prevent accidents and incidents that can cause injury, property damage, and possibly loss of life. The human losses in an accident are traumatic for surviving families and friends. But in addition to its moral duty to prevent accidents, the management of an aviation operation is charged with protecting the company's financial bottom line. It is therefore reasonable to question the cost-benefit ratio associated with implementing a new, or improved, safety programme.

There is, however, a paradox when trying to measure the benefits of a safety programme. If a programme is effective, there will be few incidents and accidents. So how does a company assign cost savings to incidents and accidents that did not occur?

Poor Safety = Poor Financial Performance

A highly profitable, low-fare airline was involved in a fatal accident. Following the accident, questions surfaced about a variety of safety issues. Within weeks of the accident, the civil aviation authority involved grounded the airline's fleet amid public examination of the airline's safety practices. After an intensive review, which resulted in changes and improvements within the airline – and the industry – regulators found the airline fit to fly.

When the airline resumed service some three months later, its stock plummeted and its fleet was operating well below capacity. The statement "Poor safety performance = poor financial performance" leaves little room for argument. Moreover, the industry at large – airframe and engine manufacturers, maintenance organisations, insurers, regulators, and the airlines and operators – can often pay a price too. The public can demand that government impose sweeping new regulations that would offer a **perceived** (but not necessarily an actual) improvement in safety, while resulting in **real** increases in costs and complexities for everyone. Thus valuable resources could be diverted from where they could have a positive influence on real safety.

Safety – a Competitive Advantage

A highly successful airline conducted a survey of its customers. The survey showed that about 25 percent of the respondents chose the airline over its competition because of convenient flight schedules; another 25 percent preferred its generous frequent-flier programme. But the most significant finding was that about **50 percent** selected the airline because of its excellent safety record!

Safety is Free

Implementing a safety programme costs money, but tremendous financial benefits often result from an airline functioning at peak safety levels. An effective safety programme, for example, can lower workers' compensation and aircraft insurance premiums.

The CEO of a large, successful and safety-minded helicopter service openly states that safety increases the company's financial bottom line. For every dollar invested in its safety programme, the company calculated that it receives eight to nine dollars in savings. Because the safety programme is credited with saving the company millions of dollars, the CEO says, "Safety is free, because the benefits are greater than the costs."

A Safety Programme – an Internal Process

This is what the International Civil Aviation Organisation (ICAO) had to say about safety programme implementation in a 1993 ICAO Circular:

"When internal responsibilities regarding safety are not clearly defined, organisations tend to rely excessively on external sources to discharge them, ie, regulatory authorities. Regulations usually represent **minimum** levels of safety compliance; furthermore, if regulations are formally applied but the sense of them is lost, the original reason for introducing them is quickly forgotten. It follows that regulation is, at best, a limited way of affecting human behaviour. Regulations cannot cover all risks involved in aviation, since each accident is unique."

What ICAO is really saying in this circular is that an operation has to have its own safety programme to achieve compliance with regulations, and that it must go beyond that to actively seek and find the latent conditions that exist within their organisation – and prevent them causing incidents.

Summary

It is up to every organisation to take up the challenge of improving their safety standards beyond the minimum regulatory requirements and to seek out and eliminate the hazards, which are lying in wait to cause an accident or incident. This can be achieved through an effective safety programme. Make sure that your organisation is actively working towards such a goal. Don't delay, start now! ■

References: "Managing for Safety – ICARUS Committee Briefing, No 5," July-September 1998 issue of ***Flight Safety Digest***. "Human Factors, Management and Organisation", ICAO Circular (1993), ***Human Factors Digest No 10.***

Short Finals and No Fuel

The aircraft was on final approach to aerodrome YY when its engine stopped through fuel exhaustion. The student pilot made a successful forced landing just short of the aerodrome.

The Cessna 172 aircraft had been "topped up" at aerodrome XX by the student during the dual portion of a cross-country training flight (YY-XX-YY) earlier in the day. The fuel tanks, however, were not dipped, and the instructor did not sight the fuel level in the tanks at the time. The instructor assumed that the student had filled them to capacity, but in fact they had been filled only to approximately one inch (2.5 cm) below the tank filler neck.

The tanks were subsequently dipped by the student at 90 litres useable prior to the student departing YY on the solo section of the cross-country exercise. This allowed little margin above VFR minimum fuel reserves. The student advised the fuel quantity to the instructor and they discussed it, but the flight was still authorised.

The engine fitted to this aircraft was modified for increased power and it was known to thus have a higher fuel consumption rate than a standard Cessna 172 engine. The student pilot was aware of this, having been alerted by the aircraft's operator (which was not the instructor's club). The operator had also made a point of telling the student pilot that the engine must be leaned in the cruise. The instructor was not aware of the higher-than-normal fuel consumption. Because of traditional thinking, the student was discouraged from leaning unless above 3000 feet.

The student became aware of the aircraft's low fuel state approximately 30 nautical miles south of YY but was reluctant to land at a nearby suitable aerodrome because re-calculation of the total fuel remaining (based on the original 90 litres useable fuel and the nominated fuel consumption rate) showed that there was sufficient to make YY. It was not until approximately 10 miles from YY that the student became extremely concerned about the fuel state.

Unexpected headwinds, some slight alterations to the planned track, and the failure to lean, eventually combined to result in fuel exhaustion. The engine stopped while on final approach to YY. A successful forced landing was made just short of the runway.

Vector Comment

Failure to ensure that sufficient fuel reserves (more than the legal 30-minute minimum) were on board, inadequate supervision by the instructor, incorrect leaning of the mixture, and a reluctance to divert to the nearest aerodrome, all combined to cause this incident.

Incorrect leaning of the mixture, unexpected headwinds, alterations to track, and poor fuel log management have led to many a surprised pilot urgently looking for somewhere to land – especially when the flight was planned with minimum fuel reserves.

The insistence by some flight training organisations that, in particular, the engine should not be leaned until above 3000 feet has been implicated in other fuel exhaustion incidents. Student pilots must be adequately briefed on why it is important to lean the mixture at any cruising altitude and how it should be accomplished (refer to the aircraft Flight Manual for advice on specifically recommended engine leaning practices). In addition, they should be encouraged to carry at least one hour's fuel in reserve, be reminded to dip fuel tanks accurately before every flight, and be taught to keep an accurate in-flight fuel log. It is up to the supervising instructor to ensure that the student does all of these things religiously.

It is also good practice to dip the aircraft fuel tanks accurately after a flight (or at an aerodrome en route) in order to calculate the fuel burnt and thus the fuel consumption rate. There could be quite a difference between this figure and the consumption rate used for flight planning. (Individual aircraft of the same type can have different fuel consumption rates; power settings and altitude will also have a bearing on the amount of fuel burnt.) Whenever you make an intermediate landing on a cross-country flight, always double-check your fuel consumption, especially in an aircraft you have not flown before.

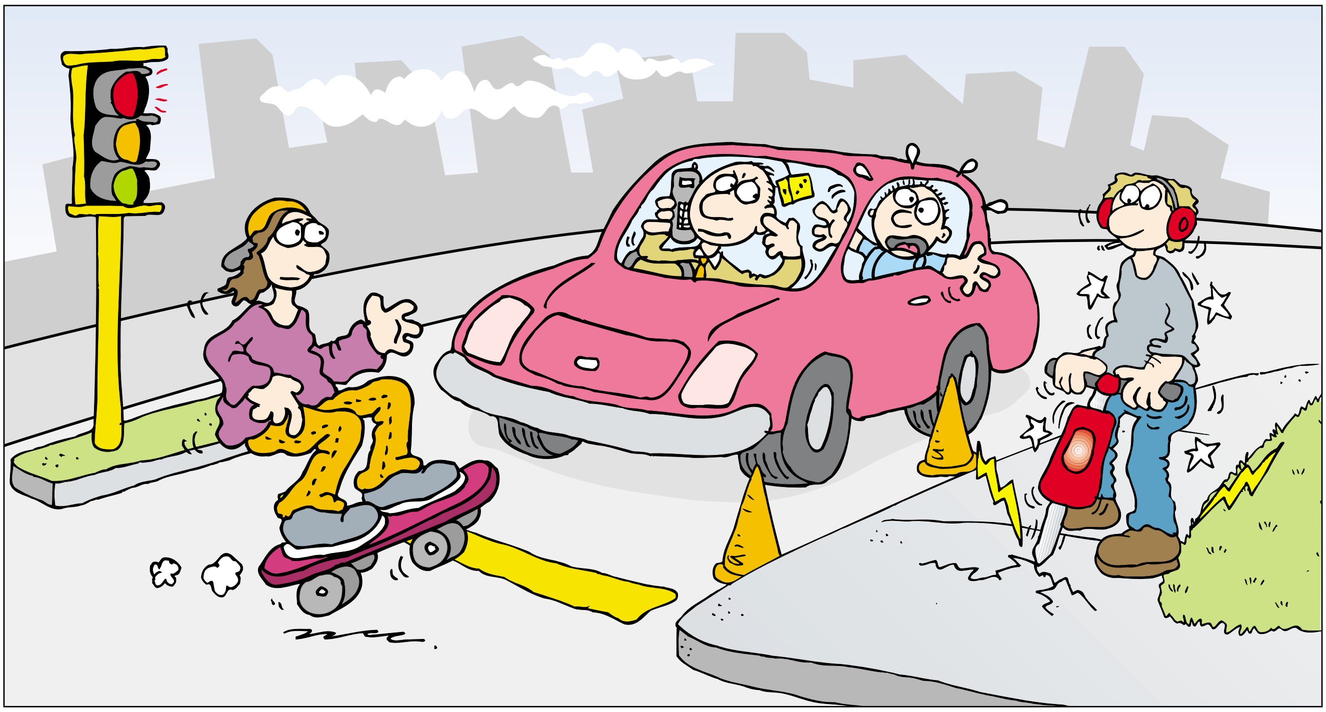
A simple consumption check at either YY or XX could well have prevented this particular occurrence.

Instructors must thoroughly check that all pilot-in-command responsibilities and requirements are met by their students before authorising solo flights. There is a significant risk that assumptions made about a student's experience, competency, or thoroughness can lead to an incident or accident – for which the instructor can be held accountable. You are largely responsible for your student's safe flight.

Students need to remember that they are the pilot in command when on a solo training flight, and that common sense must prevail when it comes to in-flight decision-making. If something doesn't seem right – assess the situation and take action. Once the words "maybe" or "I think it will be okay" creep into your thoughts – beware. It is time to act positively.

The lessons from this incident do not apply just to instructors and students. We should all take note of the need to be meticulous when it comes to flight planning and in-flight fuel management. ■

Cellphones – a Help or a Hindrance?



The following article has been adapted from the Av News section of the July/August edition of the FAA News.

Well, like in the movie "Jaws," just when you thought it was safe to go back into the water something comes along to cause you grief. In the past, this magazine has reported how cellular telephones have saved lives, and how one was even used to contact air traffic control when a commercial aircraft's radios failed. Now, we have heard of a problem caused by cellular telephones. Fortunately, it is a problem that can be avoided or at least minimised. An Air Traffic Manager at one of the FAA's Automated Flight Service Stations (AFSS) has a problem with cellular phones. The problem is pilots are calling the AFSS for weather briefs and for filing flight plans using cellular telephones. As the manager stated in the letter to the magazine, in most cases the reception is bad and the background noise level results in mis-communication and numerous repeats of information. In the interest of safety for our flying customers, we would like to submit the following scenario:

'You forget to call for a weather briefing at the office or home, so the cellphone comes in handy as you drive to the aerodrome. You get a briefer on the line, but someone is yelling in the background as they are giving you the weather. So, you end up getting part of it only. Just as the briefer begins to give NOTAMs for your destination aerodrome, you stop at a red light and construction workers are busting up the footpath with a jackhammer. But, you were just at the aerodrome yesterday, so nothing should have changed. As you begin giving your flight plan, your reception starts to fade because you called long distance to reach your favourite briefer. The briefer understood you to say an altitude of 5000 feet, but you said 9000 feet.'

Pilots without cellular phones are almost as rare nowadays as aircraft without radios. Just as radio reception varies from one place to another, cellphone reception and signal quality also vary. Taking the time to verify that your cellphone reception is clear and free from interference, while calling for pilot briefing services, ensures that the specialist understands your request. And you receive the information needed to have a safe and 'uneventful' flight. Safety is the main rule of the game, even before you start your engine.

Vector Comment

If you are one of the pilots just described, you may want to consider the background noise environment and the signal strength of your cellphone when calling the National Briefing Office (NBO). We suggest that whenever possible, you should use a standard telephone to call the NBO to obtain pre-flight information or file a flight plan or Sarwatch. That way both you and the briefer will be able to hear each other clearly. Using a regular telephone may be the safer option in many situations. Effective communications are always important when planning a flight, so make sure that you don't compromise them by using a cellphone in an unsuitable environment. ■

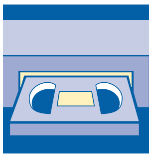
ASC Course Reminder

Don't forget the Aviation Safety Coordinator training courses to be held in Palmerston North on 30 September to 1 October and Hamilton on 7 to 8 October.

An Aviation Safety Coordinator runs the safety programme in an organisation. Does your organisation have a properly administered and active safety programme? (See the previous issue of *Vector* for further detail on the 'what and why' of an aviation safety programme.)

If you are involved in commuter services, general aviation scenic operations, flight training or sport aviation this course is relevant for your organisation.

For further information and enrolment forms contact: Rose Wood, SEPU Administrator, Civil Aviation Authority, PO Box 31-441, Lower Hutt, email **woodr@caa.govt.nz**



Safety Videos

Here is a consolidated list of safety videos made available by CAA. Note the instructions on how to borrow or purchase (ie, don't ring the editors.)

Civil Aviation Authority of New Zealand

No	Title	Length	Year released
1	Weight and Balance	15 min	1987
2	ELBA	15 min	1987
3	Wirestrike	15 min	1987
6	Single-pilot IFR	15 min	1989
7	Radar and the Pilot	20 min	1990
8	Fuel in Focus	35 min	1991
9	Fuel Management	35 min	1991
10	Passenger Briefing	20 min	1992
11	Apron Safety	15 min	1992
12	Airspace and the VFR Pilot	45 min	1992
13	Mark 1 Eyeball	24 min	1993
14	Collision Avoidance	21 min	1993
15	On the Ground	21 min	1994
16	Mind that Prop/Rotor!	11 min	1994
17	Fit to Fly?	23 min	1995
18	Drugs and Flying	14 min	1995
19	Fatal Impressions	5 min	1995
20	Decisions, Decisions	30 min	1996
21	To the Rescue	24 min	1996
22	It's Alright if You Know What You Are Doing – Mountain Flying	32 min	1997
23	Momentum and Drag	21 min	1998
24	The Final Filter	16 min	1998
25	We're Only Human	21 min	1998
26	You're On Your Own	15 min	1999
27	Rotary Tales	10 min	1999

Miscellaneous individual titles

Working With Helicopters	8 min	1996*

*re-release date

Civil Aviation Authority, Australia

The Gentle Touch (Making a safe approach and landing)	27 min
Keep it Going (Airworthiness and maintenance)	24 min
Going Too Far (VFR weather decisions)	26 min
Going Ag – Grow (Agricultural operations)	19 min
Going Down (Handling emergencies)	30 min

The videos are VHS format and may be freely copied, but for best quality obtain professional copies from the master tapes — see "To Purchase" below.

The New Zealand tapes are produced on a limited budget, the first 11 titles using Low-band equipment. Quality improves in later titles. While the technical quality of the videos may not be up to the standard of commercial programmes, the value lies in the safety messages.

To Borrow: The New Zealand tapes may be borrowed, free of charge, as single copies or in multi-title volumes (Vol A contains titles 1 to 8, Vol B titles 9 to 14, Vol D titles 15 onwards. The Australian programmes are on a multi-title volume (Vol C). Contact CAA Librarian by fax (0–4–569 2024), phone (0–4–560 9400) or letter (Civil Aviation Authority, PO Box 31–441, Lower Hutt, Attention Librarian). **There is a high demand for the videos, so please return a borrowed video no later than one week after receiving it.**

To Purchase: Obtain direct from Dove Video, PO Box 7413, Sydenham, Christchurch. Enclose: **$10 for each title** ordered; plus **$10 for each tape** and box (maximum of 3 hours per tape); plus a **$5 handling fee** for each order. All prices include GST, packaging and domestic postage. Make cheques payable to "Dove Video".

Survival Uses For Aircraft Parts

We thought that publishing this list would be a useful addition to "Surviving After a Crash"; which featured in the previous issue of *Vector*. You might consider cutting it out and adding it to your survival kit.

AIR FILTER – Fire starter since it is usually made of paper and is impregnated with highly flammable oil.

ALUMINIUM SKIN – Reflector for warmth from a fire; signalling device; splint; snow shovel; saw blade.

BATTERY – Signalling with aircraft lights or radio; fire starter.

BATTERY BOX – Stove or cooking container.

CHARTS/MAPS – Stuff inside clothing for insulation. (Don't burn them, since you may need them for navigation if it becomes inevitable that you need to walk out.)

COMPASS – Direction indicator.

CONTROL CABLES – Binding for shelter; splints.

DOORS – Shelter; windbreak.

ENGINE COWLING – Shelter; water collection; windbreak; fire platform.

ENGINE MAGNETOS – Fire starter.

ENGINE OIL AND FUEL – Fire starter and fuel for fire; makes black smoke for signalling.

FABRIC SKIN – Fire starting material and fuel; water collection.

HOSES – Siphoning fuel from tank.

PTO

CUT OUT AND KEEP

INNER TUBES – Elastic binding material when cut into strips; black smoke when burned.

INTERIOR FABRIC – Water straining or filter; clothing or coverings; bandages; fuel for fire.

LANDING LIGHTS/STROBES – Signals when used with battery; lights at night; reflective surfaces for signalling when the battery dies.

NOSE CONE/SPINNER – Bucket for water, oil and fuel; scooping tool; pot for cooking; funnel.

OIL FILTER – Burn for black smoke.

ROTATING BEACON LENS – Drinking cup.

RUGS – Ground pad; insulation; clothing or warm covering.

SEATS – Sleeping cushions; back brace for spinal injury; insulation; ground pad; sponge rubber for neck support.

SEATBELTS – Binding material; slings; bandages.

TYRES – Black smoke when burned.

VERTICAL STABILISER – Shelter support; fire platform.

WINDOWS – Cutting tool.

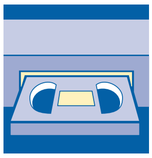
WINGS – Wind break; shelter supports; overhead shade; platform for fire; water collector; signalling device. (If the aircraft is intact, blankets or plastic tarps draped over the wings and secured to the ground make an excellent tent.)

WINGTIPS – Drip collection; water carrier.

WIRING – Binding and rope; starting fire with battery.

WOODEN WING STRUTS, BRACES OR PROPELLERS – Fire starter; fuel.

Source: *FAA News*; US Department of Transport



New Video

Between 1 April 1994 and 15 April 1999 there were 133 accidents in New Zealand involving helicopters. Thirteen pilots died along with 19 passengers. There were, during this same period, many more incidents involving helicopters that came very close to being up-graded to accident status.

Rotary Tales is a new safety video that has just been released by the CAA. This 10-minute video consists of two short sketches that carry safety messages for all helicopter pilots.

Interestingly, the video does not contain any film footage of helicopters at all. How did we make a helicopter safety video without showing a helicopter? If you want to find out the answer to this question, borrow a copy from the CAA Library or purchase one from Dove Video. Don't forget that the CAA has a whole range of other safety videos, which can also be borrowed free of charge from the CAA Library. See this issue of *Vector* for details.

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
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Murray Fowler
(South Island)
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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

Safety and Professionalism — Don't start without them!

Publications

0800 800 359 — Publishing Solutions, *for CA Rules and ACs, Part 39 Airworthiness Directives, CAA (saleable) Forms, and CAA Logbooks. Limited stocks of still-current AIC-AIRs, and AIC-GENs are also available. Also, paid subscriptions to Vector and Civil Aircraft Register.*

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-FQN, Rutan Variviggen, 28 Aug 98 at 1700, Rotorua. 2 POB, injuries 2 fatal, aircraft destroyed. Nature of flight, private other. Pilot CAA licence PPL (Aeroplane), age 42 yrs, flying hours 277 total, 0 on type, 10 in last 90 days.

This was the first flight in the aircraft by the pilot who was not type rated. He was accompanied by the owner/builder who did not hold any pilot qualifications. About 20 minutes into the flight, the aircraft was seen to complete a number of turns and then head back towards the aerodrome. Another turn (to the right) was commenced and the aircraft's nose was seen to fall followed by a spiral dive into the ground.

The on-site investigation did not reveal any evidence of a mechanical failure or malfunction. According to witnesses and the investigation, the engine appeared to be operating normally up to the time of impact

Main sources of information: CAA field investigation

CAA Occurrence Ref 98/2360

ZK-TOY, Corby CJ-1 Starlet, 7 Sep 98 at 1810, Pikes Point. 1 POB, injuries nil, damage minor. Nature of flight, private other. Pilot CAA licence PPL (Aeroplane), age 22 yrs, flying hours 200 total, 130 on type, 30 in last 90 days.

The aircraft encountered a soft wet patch after landing on the grass runway at Pikes Point, and nosed over onto its back. The aircraft sustained only minor damage to the top of the rudder and the canopy.

Main sources of information: Accident details submitted by pilot

CAA Occurrence Ref 98/2462

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.

At about 1152 hours on 14 September 1998, ZK-DKL, a Cessna 177 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 the two passengers were killed on impact .

The aircraft probably encountered a strong laminar downdraught, before entering a thin layer of cloud prior to impact. Although ample escape options were available to the pilot to turn away from the rising terrain ahead, the pilot did not make a timely decision to do so. The pilot may not have recognised that he was descending quickly towards the cloud layer and mountainous terrain until shortly before entering cloud. The pilot may have believed he had crossed the Main Divide to the west, and once ZK-DKL had entered cloud he most likely elected to continue straight ahead in order to break out of the cloud, as he knew the conditions were clear on the West Coast.

Why the pilot did not make a timely turn away from the rising terrain ahead is unexplained. The pilot might have persevered for too long expecting to encounter an updraught, or some distraction could have diverted his attention away from the safe operation of the aircraft. Alternatively, the pilot might have been unaware of, or have misjudged, the intensity of any downdraught encountered.

The cause of the accident was not established.

Main sources of information: Abstract from TAIC Accident Report 98-009

CAA Occurrence Ref 98/2511

ZK-HSC, Sikorsky S-55B, 22 Sep 98 at 1600, Winton. 1 POB, injuries nil, damage substantial. Nature of flight, agricultural. Pilot CAA licence CPL (Helicopter), age 43 yrs, flying hours 1500 total, 620 on type, 80 in last 90 days.

The helicopter was conducting agricultural spraying when it suffered a power loss while downwind. A heavy landing at 30 knots resulted, which caused the undercarriage to collapse and a main rotor blade to cut through the tail boom. Further investigation found white deposits at the exhaust outlet, indicating that the engine had been running on a weak mixture. This could have caused the power loss.

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

CAA Occurrence Ref 98/2665

ZK-HWO, Bell 206B, 9 Oct 98 at 1700, Okahu Valley. 1 POB, injuries nil, damage substantial. Nature of flight, other aerial work. Pilot CAA licence CPL (Helicopter), age 30 yrs, flying hours 4500 total, 2500 on type, 119 in last 90 days.

The helicopter was lifting an underslung load when it suddenly lost power at about 30 feet agl. The subsequent forced landing was heavy and the helicopter impacted the ground ahead of the sling load with the engine still running. The pilot shut it down after the impact.

The pilot reported a TOT reading of about 900 degrees Celsius at some stage during the accident sequence of events. Significant investigation of all systems components did not reveal the cause of the power loss.

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

CAA Occurrence Ref 98/2868

ZK-GDV, Slingsby T51 Dart, 18 Oct 98 at 1320, nr Blenheim. 1 POB, injuries 1 fatal, aircraft destroyed. Nature of flight, private other. Pilot CAA licence nil, age 86 yrs, flying hours 146 total, 53 on type, 1 in last 90 days.

The pilot was on a soaring flight to the south of Blenheim, and had climbed from 700 feet in the circuit area of the Omaka aerodrome to over 4000 feet in the vicinity of Orchard Spur. The last communication from the pilot was an 'ops normal' call made at about 1315 hours. The wreckage of the glider was sighted at about 1400 hours near the crest of the spur at an elevation of 2300 feet. The aircraft had struck the ground in a steep nose-down attitude after apparently stalling. No fault could be found with the airframe.

No definite cause was established for the accident, although the prevailing turbulent conditions and lack of recent piloting experience were probably contributing factors.

Main sources of information: CAA field investigation.

CAA Occurrence Ref 98/2908

ZK-FPE, Micro Aviation B22 Bantam, 1 Nov 98 at 0830, Whakatane. 1 POB, injuries 1 minor, damage substantial. Nature of flight, private other. Pilot CAA licence nil, age not known, flying hours 668 total, 480 on type, 6 in last 90 days.

The aircraft engine failed at 800 feet. The pilot attempted a forced landing into a farm paddock but undershot the approach and struck the downwind fence.

The cause of the engine stoppage was found to be a failed small-end bearing. The aircraft manufacturer advised that, while big-end bearing failures in the Rotax 532 engine occur from time-to-time, small-end failures are virtually unheard of. There is a set procedure for monitoring big-end bearing play, and if performed regularly, it can give warning of an impending failure. Small-end play would also be detectable by the same procedure, but if excessive play were detected, it would be only on engine dismantling that it could be attributed to one end or the other of the relevant connecting rod

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

CAA Occurrence Ref 98/2977

ZK-HOA, Hughes 269C, 4 Nov 98 at 1900, Lindis Pass. 1 POB, injuries nil, aircraft destroyed. Nature of flight, mustering. Pilot CAA licence PPL (Helicopter), age 39 yrs, flying hours 3309 total, 2900 on type, 50 in last 90 days.

The pilot reported that while mustering sheep on a ridge-top he decided to use the aircraft skid to assist getting a sheep out from a bush. However, the sheep jumped out of the bush and landed on the skid causing the pilot to lose control of the aircraft. The low impact forces did not activate the ELT.

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 98/3014

ZK-SPW, Rans S-14 Airaile, 7 Nov 98 at 1630, Auckland. 1 POB, injuries nil, damage minor. Nature of flight, private other. Pilot CAA licence nil, age 56 yrs, flying hours 1600 total, 200 on type, 15 in last 90 days.

The aircraft suffered an engine failure while over water. The pilot made a successful forced landing on to mud flats.

Investigations revealed that the crankshaft's centre main bearing had failed.

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 98/3194

ZK-MXP, Eipper Quicksilver MX II, 8 Nov 98 at 1400, Lichfield. 1 POB, injuries 1 serious, damage substantial. Nature of flight, private other. Pilot CAA licence PPL (Aeroplane), age 21 yrs, flying hours 85 total, 5 on type, 5 in last 90 days.

The aircraft was heard to approach the strip and then suddenly apply power. This was followed by an audible 'thump' a short time later.

The pilot estimated that there was a crosswind of 10 knots at the time of the accident. The pilot later indicated that he had encountered a very strong wind gust at about 15 feet agl, which upset the microlight longitudinally, while approaching the strip. The nose dropped, but application of power and back pressure on the stick failed to improve the situation. The aircraft impacted the ground in a nose-down attitude.

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

CAA Occurrence Ref 98/3039

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.

Partenavia P 68B

Lycoming IO 360-A1B6 top through-bolt fails, P/N 75155

After levelling off in the cruise, the lefthand engine started to vibrate and lose power. The aircraft was immediately returned to the departure airfield. Trouble checks were completed and power was reduced to ease the vibration. The engine was not shut down due to power still being available.

Inspection revealed that the top through-bolt adjacent to No.3 cylinder had failed, resulting in the transmission of higher loads to the remaining cylinder base studs. The cylinder eventually loosened, causing the vibration to worsen and the crankcase to crack. TSO 1513 hrs; TSI 40 hrs.

ATA 8500 CAA Occurrence Ref 98/1265

Partenavia P 68B

Prestolite ALU-8421R alternator wiring shorts, P/N ALU-8421R

On approach the righthand alternator circuit breaker popped. Five seconds later the lefthand alternator circuit breaker also popped. The pilot decided to continue, as conditions were not completely IMC, when the battery circuit breaker popped. He then had to use his torch and managed to land safely about 10 minutes later.

Subsequent inspection revealed a wire from the diode back plate was shorting, causing the circuit breakers to pop.

ATA 2410 CAA Occurrence Ref 98/2063

Partenavia P 68C

Engine mounts crack

During scheduled maintenance the lower engine mounts on both of the engines were found to be cracked.

A fleet check also revealed engine mount cracks on another aircraft. The Partenavia P68 engine mounts are known to crack but not in the area identified in this case. An Airworthiness Directive is under preparation to increase the applicable inspection interval. TTIS 3250.

ATA 7120 CAA Occurrence Ref 98/155

Piper PA-23-250

Hydraulic pump gasket fails

The pilot had to make an 'urgency call' because the lefthand engine was smoking. A full emergency was declared and the aircraft returned for a successful landing.

Further investigation revealed that the gasket between hydraulic pump and crankcase had failed allowing oil to leak out. The engineer stated that an incorrect gasket had been fitted two years earlier.

ATA 2900 CAA Occurrence Ref 98/46

Piper PA-23-250

Righthand alternator fails, P/N ALX 842R

The crew experienced a total electrical failure and advised ATS of the situation by cellphone. ATS were then able to observe the aircraft as a primary radar target. Communication via cellphone was subsequently lost resulting in a Local Standby being declared. Cellphone communication was, however, regained with ATS and then with the Tower while on final approach to the runway. The aircraft landed safely.

Further investigation revealed that the lefthand alternator had a loose field wire, and that the righthand alternator had a collapsed rotor. The ammeter was also determined to have been inoperative. The ammeter and righthand alternator were subsequently replaced and the loose field wire was repaired. TSO 715hrs.

ATA 2410 CAA Occurrence Ref 98/652

Piper PA-28-181

Faulty fuel tank selector

After the downwind checks had been completed the engine failed. Subsequent checks during the glide revealed zero fuel pressure.

The student had inadvertently selected the fuel to 'OFF' while changing tanks during the downwind checks. The student discovered his error and quickly switched to the left tank. Engine power was restored allowing the instructor to perform a normal landing.

Further investigation revealed that the fuel selector lever was sitting too high and did not even touch the indent stop, which is designed to prevent fuel 'OFF' being inadvertently selected.

ATA 2820 CAA Occurrence Ref 98/2147

Piper PA-46-310P

Fuel line 'T' union breaks

When the aircraft was in a late lefthand downwind position the aircraft suffered a partial engine failure. The pilot was able to carry out a successful forced landing.

Engineers discovered that the 'T' union to the throttle metering assembly had cracked and broken off, isolating the fuel supply to the engine. TTIS 1450 hrs.

ATA 7310 CAA Occurrence Ref 98/3196

Pitts S-2E

Aviat forward-retention strap breaks

On pulling up for an aerobatic manoeuvre the pilot heard an unusual thump. A quantity of fuel splashed over pilot's right leg. The pilot observed that the fuel cap was no longer visible and that rudder movement was restricted. 'Off Checks' were carried out and a successful dead-stick landing was accomplished, despite limited rudder travel.

Further investigation revealed that the forward fuel-tank retention strap had failed adjacent to its bolt attachment hole. This allowed the front of the fuel tank to drop into the fuselage where it partially obstructed rudder pedal movement.

ATA 2810 CAA Occurrence Ref 98/583

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

Occurences

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

Robinson R22 Beta – Pilot loses control of helicopter after takeoff

Witnesses reported seeing the helicopter land in the corner of a fenced paddock. A short time later the helicopter took off again, but, after climbing to about three metres above the ground, it began rotating and gyrating erratically, contacting the ground a number of times. It came to rest in an upright position but with the tail boom severed and damage to the main rotor assembly and gearbox.

The pilot reported that he had recently recovered from a viral complaint, which was characterised by severe coughing bouts, but had been free of these symptoms for a few weeks. As he flew over the area of the accident, however, he had experienced the incipient stages of a coughing fit so he landed the helicopter, shut the engine down, and walked around for a short time until the symptoms disappeared. He then reboarded the helicopter to continue the flight, but shortly after liftoff was overcome by a severe coughing fit. This caused him to partially lose control of the helicopter and it contacted either the fence or the ground.

Cessna 152 – Engine fails after takeoff

The instructor and student were conducting crosswind-training circuits on runway 07 at Redcliffe. At approximately 200 feet agl, after takeoff on the third circuit, the engine began to run very roughly. The instructor immediately assumed control and transmitted a Mayday call. A decision was then taken to carry out a landing onto the clear swampy terrain straight ahead. The aircraft nosed over soon after touching down on the soft surface. Both occupants were able to exit the aircraft without assistance.

The investigation found that the No 4 engine cylinder had a large fatigue crack in the non-finned base area, that extended approximately two-thirds the circumference of the cylinder wall. No other defect was found with the engine, accessories or engine control systems that would have contributed to the rough running.

It is probable that the rough running was caused by excessive valve clearances and/or piston-to-cylinder binding, as the crack opened under load.

Twin Astir (VH-IKA) – Glider wing clips tree while landing out

The gliding club was conducting a ridge-soaring camp remote from its main base of operation, but gliders launched that morning by aero-tow were reporting poor lift conditions.

A glider, released near the ridge just prior to VH-IKA taking off, was finding it difficult to find any significant lift, and the pilot believed that they had released too early for the prevailing conditions. He saw VH-IKA release about 400 to 500 feet lower than he had, and commented to his passenger that VH-IKA would have to land out.

A short time later he saw VH-IKA tracking towards some suitable paddocks, but they were overflown, then, after several left and right turns, VH-IKA commenced a low approach to land in another paddock.

The paddock selected was lined by trees and powerlines, and, as the approach was continued, the left wing clipped a tree and the glider impacted the ground inverted. Both occupants were injured and the glider substantially damaged.

The occupant of the rear seat held a gliding instructor rating but was riding as a passenger on this flight. Although he realised that the approach was becoming low, he did not doubt that the experienced pilot could handle the situation and failed to take action to prevent the accident.

United Kingdom

Occurrences

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

BAe146 – Aircraft overruns runway on landing

The aircraft allegedly touched down slightly beyond the normal touchdown zone on runway 22, and due to lack of effective braking overran the end of the runway onto the grass undershoot area. The aircraft became bogged down in mud, but no damage occurred.

Investigations revealed that the landing was made with a 10-knot tailwind component. ATC had advised that the runway was "wet with water patches" but the crew did not make any operational adjustments to the landing technique to address the problem that braking action might be poor. All aircraft systems were found to be serviceable and braking performance was within design expectations.

The operator has taken appropriate flight crew action and issued a Flight Crew Notice to address the points raised by the investigation.

SDD Occurrence No 9805489J

Cessna 177 – Manifold pressure and fuel flow decrease en route

During the cruise the pilot noted that the engine's manifold pressure and fuel flow had decreased, which was accompanied by an increase in exhaust gas temperature. A safe landing was subsequently made.

The pilot reported that similar problems had occurred intermittently over the previous two months, and investigation found that the alternate air door had come adrift and jammed the fuel injector unit. Rivets in the air door hinge assembly had parted from the main body of the air box, probably as a result of vibration. A new air door was fitted.

SDD Occurrence No 9805193H

WEIGHT A MOMENT!

Are you loaded properly?

SEPTEMBER 1999