Navigation NEWS
MARCH/APRIL 2008
The magazine of the Royal Institute of Navigation

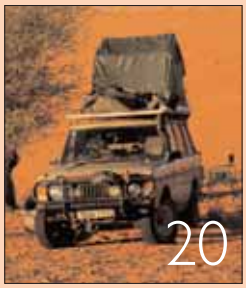
Double Jeopardy

RIN 08: Your Conference Guide

Equipping An Expedition

Navigation NEWS

Navigare Necesse Est



News

Features

Regulars

Comment

The prudent navigator

Our Institute is a meeting place for exchanging views. Rarely does it make a policy statement. But in 2004 Council, recognising that satellite navigation was vulnerable to loss of service, strongly recommended maintaining and updating the terrestrial Loran C system as a backup. It proposed this policy as part of the European Radionavigation Plan, then in draft form. Has this happened? Well, yes and no!

The last *Navigation News* reported that the UK and Ireland had launched a station to transmit Enhanced Loran (eLoran), the new high-performance replacement for Loran C. Then, the US Department of Homeland Security announced that the US had abandoned its former GPS-only policy and will implement an eLoran positioning, navigation and timing back-up to GPS. This decision originated with the US Volpe Report of 2001 which identified the vulnerability of GPS to interference, spoofing and solar storms. It was followed by intense technical studies on land, sea and air, then a worldwide policy consultation, and finally a high-level Independent Assessment led by Professor Bradford Parkinson, the 'father of GPS.'

And Europe, with its Radionavigation Plan? Understandably, our European eyes are on Galileo, our own exciting foray into satellite navigation. The RIN has just hosted part of the UK's intense Galileo debate. But sadly, concentration on Galileo has diverted Brussels' resources and attention from all other navigation matters. There's a Galileo planning blight! The 2004 European Radionavigation Plan draft lies in a drawer in the EC. There are no US-style vulnerability studies here, despite Volpe's warning that Galileo shares much GPS vulnerability. Recent losses of GPS service to solar flares and interference are ignored.

So US, UK, and now Chinese and Russian policies all point to GNSS supported by an eLoran backup – just what the RIN recommended! Europe risks missing out on its potentially unbeatable Galileo-GPS-eLoran combination.

David Last, RIN President

FRONT COVER

The front cover of this issue shows the Atlantic Ocean, from the deck of Tristan Gooley's boat, *Golden Eye*.

EDITORIAL

Managing Editor
Gp Capt DW Broughton MBE
e-mail: director@rin.org.uk

Editor
Tony Fyler
Tel: +44 (0)20 7591 3133
e-mail: editor@rin.org.uk

Membership
Details of Membership of the RIN may be obtained by contacting the RIN office at the address below.
Royal Institute of Navigation
1 Kensington Gore
London SW7 2AT
Tel: +44(0) 20 7591 3130
Fax: +44(0) 20 7591 3131
e-mail: membership@rin.org.uk
Web site: http://www.rin.org.uk

PUBLISHING & ADVERTISING

Art Editors
Ian Swain and Dave Blake

Advertising Sales
Rod Sessions
Mercator Media Ltd
The Old Mill, Lower Quay
Fareham, Hampshire
PO16 0RA UK
Tel: +44 (0)1329 825335
Fax: +44 (0)1329 825330
e-mail: navnews@mercatormedia.com

Navigation News is published bi-monthly by Mercator Media Limited on behalf of the Royal Institute of Navigation.

Imageset and Printed by:
Holbrooks Printers Ltd, Portsmouth.

ISSN 0268 6317

News in Brief

Mobiles On Planes in EU Cleared

The use of mobiles on planes flying in European airspace has been given approval by UK regulator Ofcom. It has issued plans that will allow airlines to offer mobile services on UK-registered aircraft.

The decision means that mobiles could be used once a plane has reached an altitude of 3,000m or more. The decision to offer the services now falls to individual airlines. However, there are other regulatory hurdles to overcome before the technology is considered to be fully approved. The European Aviation Safety Agency needs to approve any hardware that would be installed in aircraft to ensure that it did not interfere with other flight systems.

The Civil Aviation Authority has said that many airlines would be interested in offering the mobile option, but added that none had formally approached it as yet.

Conditional Galileo Support From DfT

The UK Department for Transport has responded to the Select Committee on Transport's scathing report on Galileo published on 12 November 2007 (see previous news).

The very long response concludes:

- The Government notes the Committee's conclusions but we believe…that the clear direct benefits to the UK, together with the wider potential benefits to the UK and European economies from the Galileo system operating alongside GPS, justify the UK's continuing support for the project.
- This will be subject to ensuring that the project is constrained within the agreed budget…that risks can be effectively managed…and that there is an open, competitive procurement architecture with parallel multi-source procurement.

The full response can be downloaded at http://www.publications.parliament.uk

INTERNATIONAL BRIEFING

Galileo Seminars Pit Facts Against Figures

The European version of GPS continues to exercise the minds of navigators, commercial players and politicians. The RIN held a landmark seminar at its London headquarters on 12 February to hear views from all sides of the debate.

In particular, the RIN was honoured to have Mrs Gwyneth Dunwoody of the House of Commons Transport Select Committee, which late last year published a frank assessment of the value of Galileo, along for the day. She described Galileo as having been 'bowling along quite happily without the House of Commons taking too much of an active interest in it.' While acknowledging that the project would probably be 'quite useful,' she nevertheless underlined the Committee's concerns over escalating costs, and described the Committee's analysis of current estimates for the project. 'We were rather boring,' she admitted. 'We said that comprehensive, rigorous and realistic information was in short supply. That's House of Commons words for "God, what's going on here?!" The €2.37bn figure from Europe contains £298 for "contingencies." Nevertheless, we were concerned, and the government agreed with us. Now obviously if you have an invention which is going to be important to the way you are developing your transport infrastructure, you're not only going to want to support it, you're going to want to have a detailed argument to put before the people who have to vote the money for it. And we said that while there was no doubt the Galileo project could provide a wide array of benefits, direct and indirect, the benefit projections of the European Commission appeared fanciful, with the supporting evidence rarely amounting to more than the most basic collection of data – and that was after we'd spent a considerable amount of time being spent looking at it. We also said that the impact of the five year delay hadn't been taken into consideration, and that even if there were no further delays, and Galileo was completed in 2013, the market context was undoubtedly going to be very different from that which had been originally envisaged, and it would have to operate in a completely different sphere. We said the project was at a crossroads – you either had to consider its scope, or you had to consider dropping it altogether.'

Richard Peckham, Vice-Chair of UKSpace said he was saddened by the fact that the debate about why Galileo was still going on in the UK, whereas in Europe, the view was that it was going to happen, and the focus of debate was now how to get the most out of the project. He also dismissed the idea that Galileo was largely defensible on 'political' grounds, and went on to outline what he called strong economic and prudent risk management arguments for developing the constellation.

To hear all the presentations from the *Galileo: To Be Or Not To Be* seminar, simply log on to the Nav Channel via the link on the front page of the RIN website, www.rin.org.uk.

Richard Peckham was to outline the reasons that make Galileo viable in even greater detail at another RIN event on the subject on 28 February at the Ordnance Survey in Southampton. 'Galileo, as it's currently proposed, is superior to GPS – there should be no argument about that, it's a fact,' he told the crowd. 'It's also not a competitor to GPS. The one thing I get very tired of is the argument that "nobody's asking for Galileo." Nobody was asking for GPS either except the military, but the people who use it today are very keen to have it.'

GLONASS Strides Ahead

While the Galileo satellite network is aiming to get its second preliminary satellite launched, new amendments to the Russian federal space programme should mean that 2008 sees 13 GLONASS satellites fired into orbit, rather than the six that were previously planned for this year. This would bring the number of satellites in the Russian constellation to 24 by the end of this year – with an extra six planned for deployment in 2009 bringing the complete system to 30, including in-orbit 'spares' in case of satellite malfunction. Thirty satellites has long been described as Galileo's optimal composition, but the European project is not destined to be completed until at least 2013, and may not be fully operational for some years after that.

UKHO Launches New Chart Service

As *Navigation News* went to press, the United Kingdom Hydrographic Office (UKHO) was set to unveil a revolutionary new electronic charting service to the world's commercial shipping fleet.

The UKHO will launch its new Admiralty Vector Chart Service (AVCS) at dedicated launch events in Singapore on Thursday, 3 April and London on Monday, 7 April.

AVCS integrates official electronic navigational charts (ENCs) from national hydrographic offices across the globe to provide a comprehensive world series for the international mariner.

Official ENCs are digital vector charts produced to the International Hydrographic Organisations (IHB) Standards, and are only issued by, or on behalf of, a national hydrographic office.

UK National Hydrographer Rear Admiral Ian Moncrieff stressed that AVCS contains only data that is fully compliant with safety of life at sea (SOLAS) carriage requirements for use within electronic chart display and

information systems (ECDIS).

He said: 'The UKHO has never been content to stand still and has continued to innovate throughout the past 200 years to meet the changing needs of the mariner.

'AVCS is the next phase in terms of service delivery, and we will use all of our specialisms and expertise to continue to support safety of life at sea as we enter the digital era with our new product.'

I See No Airports says KLM Pilot

We all know that sinking feeling of flattened anticipation when, minutes away from landing at our destination airport, the pilot says we will have to circle for another half an hour. But imagine if your pilot didn't actually know your destination airport existed?

That was the situation in which 233 passengers onboard a KLM flight found themselves in March. The plane, which had flown all the way from Amsterdam to India, was diverted at Hyderabad because the pilot claimed he had no knowledge of the brand new Rajiv Gandhi International airport that graces the city. He diverted the plane to New Delhi, where it was refused permission to land, meaning that the Hyderabad passengers disembarked two hours later at Mumbai – all in all, a 1,200 mile detour.

In the pilot's defence, the flight was always *bound* for Hyderabad, and the confusion arose just hours after Rajiv Gandhi International became operational. On attempting to fly into the old Hyderabad airport, he was advised by air traffic control that it had been closed, and so the detour from Hell began. However, airport officials say that all airlines were made aware that Rajiv Gandhi International would be operational from 14 March, and by the time the KLM flight arrived, there were other flights taking off and landing at the new airport.

As a matter of record for aviators – there is now a fully functioning airport in the Hyderabad suburb of Shamshabad, called Rajiv Gandhi International. If you hit Mumbai, you've gone too far.

Bees Tagged For Research

Researchers at Queen Mary University, University of London are using RFID tags to try to discover how bumblebees navigate to and from familiar sites.

Recent research has revealed that bees are able to recognise individual human faces, and the QMUL team is looking at how bees differentiate between different colours, scents, and rewards in flowers, and recall and process this information for future foraging trips, as well as how they navigate to all the 'best' flowers and still find their way back to their home nests in a straight line.

NewsinBrief

Lord Nelson Wants A Woman

The Jubilee Sailing Trust (JST) is on the hunt for an adventurous female engineer who wants to secure their place in history as a part of the first all female crew to compete aboard a Class A tall ship in a race leg of the STI Tall Ships Races 2008.

This groundbreaking voyage, which is the first of two race legs, starts off from Liverpool, UK and finishes in Måløy, Norway. It is a joint venture between the Jubilee Sailing Trust and Girlguiding UK.

The ship being used for this superb challenge is STS Lord Nelson, one of only two tall ships in the world purpose designed and built to enable a crew of mixed physical abilities aged 16 and over to sail side by side as equals. If you feel you fit the bill, or know someone who might, contact Andy Spark, Operations Manager at the Jubilee Sailing Trust, on 023 8044 3113 or andy@jst.org.uk

GIOVE-B Goes To Kazakhstan

Having spent so long in a lonely orbit, GIOVE-A, the first Galileo in-orbit validation satellite, is close to getting some company. GIOVE-B has been delivered to a clean room at the Baikonur Cosmodrome in Kazakhstan. It is now undergoing a series of checks by staff from the European Space Agency and the industrial consortium that developed it, prior to being mated with the Fregat upper stage of the launcher. Barring unforeseen delays, GIOVE-B is due to be launched into orbit on 26/27 April. Watch this space.

News in Brief

Logica…Just Logica

RIN Corporate Member LogicaCMG has followed in the RIN's footsteps and rebranded its image. In particular, the LogicaCMG brand, along with the Edinfor, Unilog and WM-data brands, have now been consolidated under one simple name. LogicaCMG is now just Logica.

CEO Andy Green said the Logica name would now stand for 'high quality, innovative services supplied by committed local teams and supported by best-in-class global expertise and delivery across the world.'

'Our local brands such as Edinfor, Unilog and WM-data have excellent track records in their local markets. We are committed to providing our customers with excellent local services, whilst at the same time combining this with the innovative capabilities and expertise of a 39,000 strong global organisation,' he added.

UK Space Strategy

New proposals for the UK's future involvement in international space activities were published on 14 February in the 'UK Civil Space Strategy: 2008 - 2012 and beyond.'

With the space sector currently contributing around £7 billion to the UK economy, the Science and Innovation Minister announced how the UK would continue to be 'at the forefront' of this expanding sector. This will include:

- Continued UK involvement in Earth observation, space science and telecoms developments
- Establishing an international space facility at Harwell, Oxfordshire, which will focus on climate change, robotic space exploration and applications
- Closer involvement in international initiatives on the future shape of space exploration to the Moon, Mars and beyond
- Setting up a National Space Technology Programme to support the development of new, innovative technologies and services.

Full copies of the strategy can be downloaded from the British National Space Centre website, www.bnsc.gov.uk

Heathrow – Five Terminals, Less Waiting?

After much controversy and amid environmental protest, Terminal 5 at Heathrow Airport was opened by Her Majesty The Queen on March 14th. The £4.3 bn terminal is set to offer extra passenger capacity without actually increasing the number of flights out of the world's busiest international airport. Its purpose will be to simplify and speed up check-in for existing flights.

Her Majesty described the new terminal building as 'bright, airy, clean and efficient' – perhaps overlooking the fact that at the launch it was filled with only 800 invited guests, rather than hordes of harassed holidaymakers whose luggage is still in Marrakech. But even before it was opened, Terminal 5 was causing controversy. Built on the site of a former sewage works on the western end of the existing airport, it has long been seen as an anti-environment development – its construction involved diverting two rivers and

erecting what is thought to be the UK's largest free-standing building. Campaigning groups like Friends of the Earth claimed that if the government was serious about climate change, Terminal 5 would mark the end of airport expansion in the UK – something that seems unlikely in the long-term.

In a nod to those who believe that chaos expands to fill the space provided, when the terminal was officially opened to the public on 26 March, it rapidly filled with irate travellers, as more than 30 flights were cancelled and the new baggage handling facilities were suspended, shutting down passenger check-in and leading to days of misery and confusion.

There are already plans to expand Terminal 5, with a second phase of development set to open in 2010.

Branching Out – Update

Following the call in the September/October issue of *Navigation News* for members to get involved in expanding the areas where the RIN could operate, there has been significant progress and development with the Institute's branch network and its Special Interest Groups. Firstly – a slight repositioning has taken place, so that the Satellite Navigation Users' Group will now deal with all navigation issues relating to space; it was felt that as satellite navigation technology has an impact on land, air and sea users, they could each best address the relevant satellite navigation issues in their spheres, whereas there were areas of space navigation that would be better served by a SIG dealing exclusively with space matters. So RIP SNUG, and arise the RIN Space Special Interest Group.

In a similar vein of reaching new areas of the navigation world, it was felt that as the Institute has been a long-time supporter of eLORAN as a key navigation infrastructure and the rest of the world appears to be catching up, the time was right to launch an eLORAN Special Interest Group. In this, the Institute has been almost ridiculously fortunate, gaining the support of Dr Sally Basker, who is an eminent voice on eLORAN at the General Lighthouse Authorities, and who will chair the SIG. If you're a RIN Member and you'd like to join her on this SIG, contact membership Secretary Colin Hatton on 020 7591 3130 or by email at membership@rin.org.uk.

Initial outreach meetings will be taking place soon in the Liverpool and Cranwell areas, with a view to setting up brand new Branches in the Northwest and East Midlands areas. For more information or to attend either of these meetings, contact Colin Hatton. What is more, the West Country Branch, previously active but recently having lain fallow, is ripe for resurrection. We will be exploring the viability of re-establishing the West Country Branch in the near future, and once again, if you'd like to be a part of that Branch, contact Colin Hatton for more details.

'…And Here's Jaws With The Weather…'

Sailors frequently live or die by the weather. Certainly they are often called to plot their navigations by its dictates. But now ground-breaking research at the University of Aberdeen could give them a new heads-up. If you want to know when a big storm is coming…watch the sharks.

Marine biology student Lauren Smith has been using Aberdeen's National Hyperbaric Centre to test the theory that sharks head for deeper water in anticipation of a big storm, and that they use their vestibular system to tell when such storms are coming.

That a shark's vestibular system contains hair cells that allow it to sense changes in pressure was established by Dr Peter Fraser FRIN, Lauren's supervisor at the University of Aberdeen. (To hear Peter speak directly about his work on depth as a factor in aquatic navigation, either catch him at RIN 08 or read the feature on page XX).

Lauren's research is thought to be the first of its kind to attempt to test the pressure theory. As well as using the Aberdeen facility, she studied shark behaviour in the wild at the Bimini Biological Field Station in the Bahamas.

Her work at Bimini enabled her to

observe shark behaviour by placing data logging tags to record pressure and temperature on juvenile lemon sharks, while also tracking them using acoustic tags and GPS technology. This let her determine the exact movements of the juveniles, the first time hydrostatic pressure sensing of sharks in situ has been approached in this way.

Lauren remains cautious about the impact of her research. 'Who can say if this could lead to sharks predicting weather fronts, there's so much more we need to understand. But it certainly opens the way to more research,' she said.

TopNav, Son Of TopNav xxxxxxx

The RIN's TopNav competition has always drawn the best and most competitive general aviators into combat to win glory by navigating, clue by clue, around a course, with the fastest and most accurate teams winning trophies, respect and the envy of all eyes. Traditionally, White Waltham Aerodrome has been the home of TopNav, and in this, its 30th year, it will once more see the battle for TopNav recognition take place, this time on 12 July. But turning 30 is enough to make even the wildest souls consider their legacy, and TopNav is no exception. Which is why the RIN is delighted to announce that this year, there will also be a TopNav North competition, held at Sherburn in Elmett, Yorkshire on 24 May. Watch the RIN website, www.rin.org.uk for more details, or to apply for either incarnation of TopNav, contact Events Manager Kathy Hossain on 020 7591 3135 or at conference@rin.org.uk.

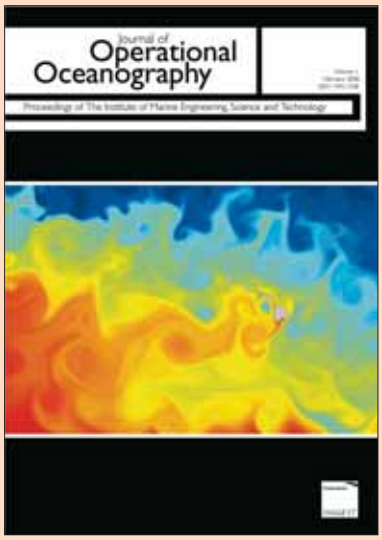
Fancy a Spell on Council?

Council is the governing body of the Institute, and its 16 members are also the Charity's Trustees. The normal term of office is three years and we try to rotate around a third of its members each year. So if you are interested in contributing to the policies and wellbeing of the Institute, why not put yourself forward for Council membership?

Any Fellow, Associate Fellow or Member may apply and returning Council members would be welcome. The commitment is just four meetings per year, although Council members are encouraged to support the Institute's main Committees – indeed Council members generally sit on at least one of the committees of the Institute in addition to their Council duties. Travel expenses are paid.

To apply, you need to be supported by one other Fellow, Associate Fellow or Member, and submit a CV of about 150 words to the Director by post or email (director@rin.org.uk). Applications must be received by 27 April.

NewsinBrief



IMarEST – New Journal, New President

The Institute of Marine Engineering, Science and Technology has launched a new peer-reviewed Journal – the Journal of Operational Oceanography. Combining a broad range of disciplines from pure physics and geology to satellite technology and systems integration, it may be of interest to many RIN members. Contact IMarEST direct for further information.

IMarEST also made history at its AGM on 13 March, when it appointed Professor Yoo Sang Choo as its 106th President. The first IMarEST member from the Far East to take on this prestigious role, the Professor takes over the reins of office from Dr David Wynford Williams, the National Hydrographer 2001-2006. Michael Everard has been appointed President-Elect.

Expensive Bridgework Down To Satnavs?

What happens when the unstoppable force meets the immovable object? Well, according to Network Rail, damage, delays and a costly repair job. The owner of Britain's rail infrastructure has said that millions of poundsworth of damage is being done to the UK's railway bridges every year – by lorry drivers following their satnavs. It claims 2,000 bridges are hit every year by lorries travelling on inappropriate roads, adding that the disruption costs the rail industry £10m a year and causes 5,000 hours of delays. Network Rail is appealing to drivers to pay attention to road signs warning them of hazards ahead.

Double Jeopardy

On 1st January 2008 RIN member **Tristan Gooley** became the first European to have both flown solo and sailed single-handed across the Atlantic. Since the tragic death of legendary navigator Steve Fossett, Tristan is the only living person to have done the Double. Here he explains how he went from being a man with some navigational hobbies to being a man who was ready to tackle the Atlantic Double.

Some ideas come, dance around a bit, and then pass by without lingering or taking root. Others creep up, seize you and don't let go until they have taken over your life. My ambition to fly solo and then sail single-handed across the Atlantic was one of those unshakeable ideas.

Never Think While At Paddington Station

I remember the moment it first got hold of me. I was eating a sandwich at Paddington train station at the time, roughly seven years ago, when I decided to do a bit of a mental assessment of my interests and ambitions. It went something like this:

'My hobbies are too disparate, there is no common theme there. I love mountains and trekking. I love sailing, but am not very experienced at it. I love flying but haven't really got to the point where I can do anything very exciting in an aircraft yet. None of these things have anything in common, they are just random leisure pursuits. No, wait a minute…'

And there, on Paddington station, it hit me. There was a common theme - navigation. Navigation united these interests very neatly. 'I'm a navigator,' I thought. It was right under my nose all along and I very nearly didn't see it.

'I know what,' I thought. 'Why don't I pursue this navigation thing? Why don't I set myself a goal that ensures that I get really quite good at it? How about I fly solo and sail single-handed across the Atlantic? That should pretty much do it.'

About a year later I joined the Royal Institute of Navigation, and six years after that I arrived in Marigot Bay, St Lucia having done the Double. It was tiring, expensive, frustating, risky, antisocial, family-unfriendly and many other things, the enumeration of which would require a thesaurus of negative adjectives, but it was also quite a journey. One I live with each day now and will never forget.

Power To The PPL

All disciplines have their learning curves and each of them have steep parts and flatter areas, although it is the steep parts that tend to stick out in the memory. Getting the Private Pilots Licence was definitely one of the steep bits. I make no apologies for stating the obvious there, because I hope it will act as inspiration to anyone finding the first part of the piloting experience quite tough. I had my first trial lesson when I was 14 and it took another ten years to get the PPL. Getting there was, like so much else in life, more about perseverance than skill. I quickly lost count of the number of weekend days where I turned down invitations from friends or family to do something carefree and fun, only to find myself drinking another cup of tea at White Waltham, watching low clouds scudding by outside. Another very valuable lesson for me came during the final run in to getting my licence: people are as critical to flight as aircraft. Bruce Hutton was the last of many instructors I had before finally getting the licence and he can take a lot of credit for keeping the momentum up until the licence was in my hand. My examiner for the final flight test was the late Freddie Stringer, who had an extremely long and impressive aviation CV and who must have notched up a lot more cups of tea than I'll ever manage at the West London Aero Club.

The nature of aviation is that a lot of people working in private flying are transitory; this is not something to be lamented, it is just a fact of life. The pay is modest at best, but the quid pro quo is that frozen ATPL pilots can get a roof over their head and build a few hours until a 'proper job' comes along. Most of these instructors are very good, but it is not their chosen vocation to instruct. I felt privileged to have flown with two people who seemingly did not want to be anywhere else in the world.

'Affirmative' Action

There are many memorable flights early on for all pilots. Few forget the first solo, or

qualifying cross-country flight and another big one for memories is the first flight with a passenger as a qualified pilot. These are all safely etched in my memory, but the fondest early memory I have came a few weeks after all of those. It was proposing to my then girlfriend, Sophie, as we waved to her parents and grandmother in her parents' garden near Hungerford from the cockpit of a club PA28. After repeating the question in my best RT voice, the answer came back and to my relief it was 'Affirmative.' My flight planning for that day had not included trying to make one of my earliest landings as a pilot-in-command with my vision seriously impaired by tears of happiness. It was a decent enough landing on the huge grass runway at White Waltham and we clambered out onto the Warrior's wing where I put the ring on Sophie's finger. The irony is not lost on me, all these years later, that my love of aviation has at times made being married to me inconvenient for Sophie to say the least.

Although flying took hold of me in a big way before sailing did, my first real moment of navigation exhilaration came at a very young age in a very small boat. I was ten and on a family summer holiday in Bembridge on the Isle of Wight. My mum had booked me into an RYA Dinghy course, which I tried to resist out of shyness at first. On the last day of a course that was as fun as any I can remember to this day, the instructor said, 'Where do you want to go?' A simple enough question, but a more of an incendiary device to a ten-year-old who was bored of following teachers, parents and others around all day. If I had to pick one moment that sowed the seed of my fascination for navigation that would certainly be it. To this day I am much more interested in the idea of being able to find my way and go places than just 'have fun'. Aerobatics and yacht racing are the way thousands like to spend their weekends, but for me it has always been more exciting to think, 'I am here. I will get there. This is how I will do it.'

Lost, Two Yompers

The most accessible form of navigation came next. I was delighted to discover that with a pair of boots, some stubbornness and a little persuasion a serious amount of navigating can be done. Summer camping holidays to the Brecon Beacons and the Lake District as a teenager were followed by more serious 'yomps'. Failing to persuade any of my equally hedonistic university friends to accompany me, I bought a ticket to Tanzania, hired a guide and porter (which was both sensible and compulsory for employment reasons) and found myself at the summit of Kilimanjaro four days later. This restored some mountain confidence which had taken a bit of a knock a year earlier when I led my best friend, Sam,

close to death on Gunung Rinjani, an active volcano and the second highest mountain in Indonesia. Fleeing from hypothermia (poor kit and planning) a hundred feet or so from the summit we got lost and separated from our tent (poor kit, planning and navigating). We spent one day with no water and two days with no food (poor kit, planning, navigating and leadership). At our lowest point we threw off our rucksacks hoping that a final run with no weight would bring survival. Crazy really, but priceless stuff from an educational point of view. The very same friend and I found ourselves between jobs at the same time when we were 24. Needing some thinking time to work out our next calamitous career move and feeling a bit restless, we put on our boots again and walked from Glasgow to London.

There was some mucking about in boats on holidays in my teens and early twenties, but nothing that could be described as mastery of the nautical art. My wife and I went on holiday to Thailand shortly after we got married and being restless souls, signed up for another RYA course. I did the Dayskipper and she took the Competent Crew course. It was great fun, but my skippering abilities were nothing to be too proud of at the end of it. It wasn't until a couple of years later that the decision to go for the Double meant that I had to find a way to ratchet up my skills and experience considerably. After another pleading conversation with Sophie, she said that if I really was set on it she wouldn't stand in my way if I wanted to sign up to a 17 week professional skipper training course.

Going Professional

January to May in the English Channel and beyond on the small yachts of the British Offshore Sailing School was fun at times, tough at others and a clear turning point in my belief in my abilities. Cruel though it sounds, there is nothing like watching people drop like flies around you in cold high seas to make you realise that maybe, just maybe, you have found your metier. Soon after the course I got my first paid sailing job, helping deliver a superyacht from Norway to Southampton.

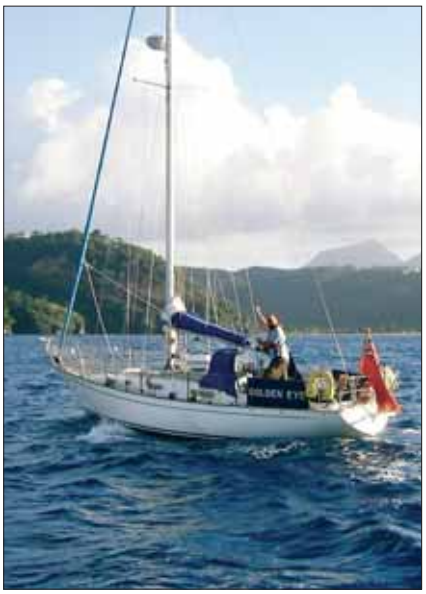
Finding the time to reach the levels of competence that I sought was as great a challenge as some of the training itself. I tended to work for a year and then pack in an intensive fortnight or work for three or more years and then take a sabbatical. During one such sabbatical I fought on two fronts to take myself from Dayskipper to Yachtmaster and PPL to Multi-Engine Instrument Rated pilot.

A word should be said about the CAA Instrument Rating, but I will not reinvent the wheel here. In this April's issue of *Flyer* magazine it is described thus:

'The IR is almost certainly the most exacting flight test that you will ever undertake. It has the reputation of being rather like the driving test only 100 times more demanding.'

It is scary. The CAA makes no distinction between someone who will shortly be at the controls of a large jet with a hundred passengers onboard coming into Heathrow and a rather enthusiastic amateur with ideas above his station. Why should they? They were qualifying me to share the same airspace after all and small planes will bring big ones down fast enough if the pilot makes a serious mistake. The 1986 Aeromexico tragedy, when a Piper Cherokee and DC9 collided, is testament to this if ever there was any doubt.

Studies for the Ocean Yachtmaster qualification followed whilst working and then sailing as Mate aboard a crewed yacht during a transatlantic voyage was the next holiday a year later. More valuable experience on this crossing included witnessing a crewmember lose nearly all the skin on both hands as he lost a fight with a halyard and suffered horrific rope burns.



The Sharp End

Qualifications are one thing, the sharp end is another. In a previous article for Navigation News I commented on the technical competence but relative inexperience of a freshly IR-rated pilot. Experience was badly needed, but time was more at a premium in 2004 than ever before. I had recently become a father and work pressures were growing steadily. The most time I managed to negotiate from family and work was a fortnight that year and so I was absolutely hell-bent on packing in as much real experience as possible. I wrote a full account of the ensuing expedition by sea, air and land from London to the summit of North Africa for this magazine. (www.toubkalodyssey.info).

My ability to cram navigational experience into the most unlikely situations knew no bounds. My long-suffering wife even managed to feign excitement when, during a precious and hens-tooth-rare 9 day break from the kids (Thank you mother and father-in-law!), I announced that I thought it would be fun to charter a yacht and sail back to our honeymoon resort in Krabi from Phuket in Thailand. For weeks before we left I used the word 'romantic' in every sentence of conversation with Soph as I excitedly bought charts online so that I could flick my dividers across them. I was the proverbial kid in a candy store. It was, thank God, the best holiday we have ever had. My dividers were confiscated by security at Bangkok airport on the way home, but it was a small price to pay.

There were occasions when getting into a boat or aircraft of any description on holiday would have been impossible. At times like this, lateral thinking is required if navigation is not to be overlooked entirely. In 2003 we were on holiday in Borneo, ostensibly for the orangutans. It was a case of the glove being on the other foot there, because before I could come up with a scheme of my own, Soph suggested that we take a couple of days out to climb Mt Kinabalu, at 13,435ft the fourth tallest mountain in South East Asia. We both enjoyed it, although she was much better during the descent than I was (I abhor relentless descents).

By 2005 my annual 'navigational leave' was down to 8 days and I was delighted when a non-flying friend who is soon to become a pilot agreed on the scheme to beat all others. In a tiny PA28 we would take off from West London Aero Club on Saturday 18th June, fly north until we got to Kiruna in Sweden and inside the Arctic Circle, check out the midnight sun and be back in time for tea on the following Saturday. It was another great holiday (www.arcticpostcard.com), and vital experience of tough IMC conditions and long hops over water with only one engine.

Brains And Boats And Planes

Although each year that passed my skills and experience were building to the necessary levels, in 2006 there were still two very big parts of the jigsaw missing if I was going to sail and fly the Atlantic. The first was a boat and the second was an aeroplane. Chartering for either crossing was an unrealistic proposal, no individual or company is going to want to see their kit missing for such long periods or to risk it on such ventures.

There was nothing else for it: I bought a Contessa 32 called Golden Eye. She is a beautiful boat and I offset concerns about the cost with the knowledge that my two sons will hopefully get their share of fun out of her in time too.

Finding an aircraft was more difficult. There was no way I could afford the perfect aircraft for such a crossing. I wrestled with decisions as to whether to sink myself into debt and buy the relatively untested Diamond Twinstar or to save some money and go for fuel-thirsty old Beech Baron. There did not seem to be as neat an option as the Contessa that was available or affordable. I had a big slice of luck at this point because I managed to get access to Cessna Caravan after the company I work for bought one. It is a great aircraft, but threw up its own challenges: it had a turbine engine for a start. Another steep learning curve was packed in and I managed to get the CAA to issue the bits of paper I needed just in time for my shot at the crossing in the May of 2007. It was tight though – my third solo flight in a Caravan and my first over an hour in length was over the freezing waters north east of Newfoundland.

Following a refit, Golden Eye was delivered to Lanzarote and, after a series of minor last

minute repairs and a lot of packing and checking, she was ready to go. Solo experience on her was again limited by time. I only had about four hours single-handed experience when I slipped out of Lanzarote and none of those were at night.

Some of that may sound a bit reckless to wiser heads, but I don't think it was. One of the major tasks in taking on challenges of this nature is being able to assess where the serious risks lie. It is impossible in one lifetime to prepare as thoroughly as would be ideal for this sort of thing, so in some ways it boils down to time allocation. I spent many hours thinking through worst-case scenarios and not a lot of time choosing food. Consequently I spent twenty-six days hating what I was eating, but managed to climb ashore in St Lucia in one piece.

Message In A Bottle

It was the same thought process with the flight last May. Hours went into fuel calculations, weather assessments and understanding the icing risks. Some less serious areas inevitably got overlooked. On my flight from Reykjavik to Wick, Scotland I realised that I had not taken care of one pre-flight check: I would not make it to landing

without going for a pee. It took quarter of an hour to fight my way out of the immersion suit and pee in a bottle, but it didn't kill me.

I have written accounts of the crossings elsewhere, and if truth be told I'm not sure they were as interesting for me as the years of preparation. They were physically fairly straightforward, but mentally taxing and exhausting. It had been a long road.

To have achieved such a long held ambition did give a tremendous feeling of satisfaction, but that did not compare to being able to look forward to a 2008 full of nice walks in the park with the family. Map and compass in the bag, of course.

Gooley Crossings Good For Prostate

Besides fulfilling a longstanding ambition to determine that he was pretty good at navigating, Tristan's Double Atlantic crossing also served a second purpose – to raise awareness of prostate cancer. 'When I first came across the Prostate Cancer Charity in 1997,' he says, 'I'm ashamed to say I knew a little about breast cancer but absolutely nothing about prostate cancer, despite the fact that it's the most common form of cancer in men.' Prostate cancer kills a man every single hour of every single day, somewhere in the world, and many men shy away from getting checked early because of where the prostate is, and how it is examined. Break the macho stereotype – get checked today, or find out more at www.prostate-cancer.org.uk

GPS In Light Aircraft
Visual Navigation
Part One

GPS has become a standard piece of kit onboard light aircraft in recent years. Civil Aviation Authority Safety Promotion Officer and RIN member **David Cockburn** examines the pros and cons of this trend towards using electronic eyeballs in light aircraft.

In the last few years, GPS has become the technology of choice for users on land, sea and in the air. Unfortunately, in the field of general aviation, little guidance has been provided by any official body on how to use this marvellous aid to navigation effectively, while maximising safety in the air. The RIN is in a unique position to provide this guidance, as part of its aim to further the development of navigation. First, let's take a look at the major kinds of incidents that occur in general aviation, and the role that GPS could play in each case.

GPS And Fatal Accidents

The most common type of fatal accident in GA is loss of control in flight[1]. Might it be that pilots become distracted by attempting to use GPS when they should be flying the aircraft – the so-called 'fiddle factor' that has led to questions over the safety of in-car satellite navigation systems? Certainly, this has been suggested in aviation, but as yet no hard evidence has been presented to support the allegation. Until it is, we have to say that GNSS is unlikely to affect loss of control accidents in good weather. However, it does appear[2] that reliance on GPS may be a major factor in pilots continuing their flight into bad weather and consequently losing control when they have no visual reference.

The second most common type of fatal accident in GA is controlled flight into terrain (CFIT). It has been argued (and there seems to be a growing amount of circumstantial evidence[3]) that GPS has encouraged such accidents because pilots may now believe they are always aware of their position during flight. They appear to be confident[4] in their ability to follow a planned track without encountering obstructions. However, to balance such circumstantial evidence, we must remember that the information available can actually improve safety *if used properly*. Commercial databases often include terrain information and provide warnings to help avoid it. These are very useful if the database is up-to-date and the equipment is properly set up to give such warnings.

Another type of fatal accident, feared by many pilots, is mid-air collision. Traditional avoidance has always been provided by the principle of 'see and be seen.' Here we encounter a serious concern about the use of GPS receivers in light aircraft. In the past, a pilot who could not see their navigation features, or their destination, would turn back or not even take off. However, the average pilot now owns an instrument that can provide not only accurate position information, but also guidance to his destination. Indeed, in many cases it can even guide the pilot along the final approach path without them actually being able to see the runway ahead.

Pilot interviews have shown that several light aeroplane and helicopter pilots have been encouraged to continue flying when the in-flight visibility was less than 3000 metres (the UK legal minimum for holders of an aeroplane Private Pilots Licence), because they were confident about their position and were happy they would not collide with the ground or an obstruction that was on it. The fact that they could not see if someone else was doing the same did not occur to them; or perhaps if it did, it did not concern them.

Visual Flight Rules

There are limitations in the Visual Flight Rules – the traditional 'see and be seen' method of collision avoidance. Human factors professionals have emphasised for many years the difficulty in physically seeing another aircraft on a collision course with one's own in enough time to take avoiding action.

Some years ago, Cranfield University and the British Gliding Association carried out some trials, which were intended to compare the visibility of certain markings on touring motor gliders. In actual fact, the most notable result of the trial was to demonstrate how difficult it is for a pilot to see and avoid another aircraft even in conditions of good visibility. The trials aircrew, who had particularly strong incentives to keep a good look-out, were in some cases unable to spot the other aircraft until they were less than 30 seconds from collision. The results of that trial show that spending more than 5 seconds at a time looking inside the cockpit is tantamount to relying completely on chance to prevent a mid-air collision.

However, chance is not such a bad protector. There have been relatively few mid-air collisions in UK airspace in recent years. Those that have occurred have of course hit the headlines, but we need to put the matter into perspective. According to CAA figures[5], between 1985 and 1994, 61 GA aeroplane deaths were attributed to Controlled Flight into Terrain (hitting the ground in bad weather), and a further 90 to the pilot losing control of the aircraft (29 in cloud) but only 13 died as a result of mid-air collisions.

While we are about to shift our focus to the mid-air collision hazard, it is interesting to ponder whether the fear of such accidents is really only a consequence of the pilot's perception (misplaced or not) that they are in control of most of the other hazards that might kill them. They have, or believe they have, the skill and knowledge to see such problems coming. However, they feel particularly vulnerable to the collision hazard, not only because there will be little or no warning of any such collision, but also because they know how difficult it is to see the threat.

The pilot can of course often obtain some assistance to reduce the collision threat if they choose to look for it. An Air Traffic Control Radar service, if available, is a useful tool. There are also many technological

advances available or in the pipeline such as ACAS or ADS-B. Glider pilots (who are particularly susceptible to the collision hazard) may invest in FLARM. However, as can be seen from the results of the CAA's consultation into the proposed mandating of Mode S transponders[6], few recreational pilots want to make the major investment required to make these technological advances generally effective. Currently, not many threats carry a working (and switched on) transponder with an altitude transmission (few birds do so for example), so it remains much more important to look out than to watch instruments. However, GPS manufacturers are already producing a form of airborne collision avoidance system, which although not as robust as the systems found in large commercial air transport aircraft, prove that technology has the potential to reduce the collision hazard, especially if Mode S is mandated and adhered to.

Controlled Airspace

There is a specific collision hazard which any author hesitates to mention for fear of being accused of alarmism. However, were a GA aircraft to collide with an airliner inside controlled airspace, the consequences for recreational aviation would be catastrophic, although of course less so than for the victims of the collision. It seems contradictory that just as a navigation system has appeared which allows GA pilots to know exactly where they are, the number of those pilots entering controlled airspace inadvertently seems to have increased. Although GPS outages do occur, they are very rare, and we do not yet seem to have suffered from any instances of malicious jamming, so the problem must lie in the techniques used by the pilots. Navigation techniques must embrace GPS to obtain the benefits while bypassing the pitfalls and allowing a reversion to so-called 'traditional' navigation in the event of equipment or satellite signal failure.

The NAVSTAR System

Sadly, although a large and increasing number of GA pilots have their own GPS receiver, even if only as a feature of a Personal Data Assistant (PDA), most of them have a less than thorough understanding of the NAVSTAR system which, when used properly (either knowingly or unknowingly), can make their life so simple. We ought to be fully aware of the system and its possible pitfalls, so they won't be detailed here, save to mention that GPS jamming is potentially the most likely hazard to affect the general aviation satnav user. Equipment manufacturers could perhaps make their instruction manuals a little easier to understand, but human factors considerations suggest that GA pilots are

their own worst enemies. How many of us, after buying a new household or entertainment gadget or piece of computer software, are guilty of 'playing' with it? We may start at the beginning of the instruction manual, but when we discover that it can do something which attracts us, we concentrate on enjoying that function and leave reading the rest of the manual 'until we get around to it.' This so often means we miss out on some particularly useful functions that would make our lives easier simply because we are naturally 'lazy' when it comes to technology.

This is a major problem with GPS use. The technology has so much to offer that the average GA pilot becomes overloaded with possible information and switches off when they have reached a level of satisfaction with their new toy.

Basic Navigation Technique

The navigation techniques currently being used by GA pilots tend to depend largely on the instructors who originally taught them. Because of a lack of standardisation, the RIN's General Aviation Navigation Group is in the final stages of producing a leaflet containing some basic techniques which are modifications of those taught by the Central Flying School to the Royal Air Force. These, it is hoped, will be endorsed by the Guild of Air Pilots and Air Navigators and the CAA, and be adopted by flying schools and individual instructors, eventually becoming the standard method of visual navigation used by PPL holders.

One of the major advantages claimed for the method, which consists of two phases – pre-flight and in-flight, is that it permits the pilot navigator to minimise the time spent with their field of vision inside the cockpit. Ideally, in flight, all the navigator need do is set a heading from a known point until it is time to change track, then set another heading for the next requisite time. The rest of the time, they can be looking ahead and around for possible hazards such as other aircraft and bad weather. They can also devote some brain capacity to thinking actively about these possible hazards if they are able to relax about their position and future direction. Observation suggests that most flights into bad weather or into terrain are the result of the pilot being mentally overloaded, and taking navigation out of the list of things the brain has to concentrate on ought to reduce that load.

However, errors in calculations and weather forecasting, as well as flying inaccuracies (the navigator is also the pilot), mean that the navigator needs to be sure they are going the right way. Most errors will be relatively minor, but we need to try to allow for human factors and 'gross errors' such as misreading a heading by 90 or 100 degrees at some stage, or applying drift backwards during calculations.

Activity Cycle

Apart from a 'gross error check' shortly after setting heading, the system ought to be able to accommodate the other inaccuracies if the navigator can re-adjust track every so often between turning points. The RAF teaches an 'activity cycle' including 'fix points' at an ideal 6 minute separation. The pilot navigator concentrates on navigation for only as long as it takes to look for the fix point, identify it, decide on any alteration to heading or timings and act on these alterations. The rest of the time he or she can spend looking out for potential hazards and occasionally carrying out appropriate routine safety checks.

Footnotes

1 CAP 667
2 Bureau d'Enquetes et d'Analyses Study "on GPS events"
3 US AOPA Air Safety Foundation found that 45% of fatal accidents involving Technically Advanced Aircraft were weather related, compared with 16% for conventionally equipped aircraft
4 NASA ASRS 2007 study "General Aviation Weather Encounters"
5 CP 667
6 UK AIC 27 of 2007 (Yellow 238)

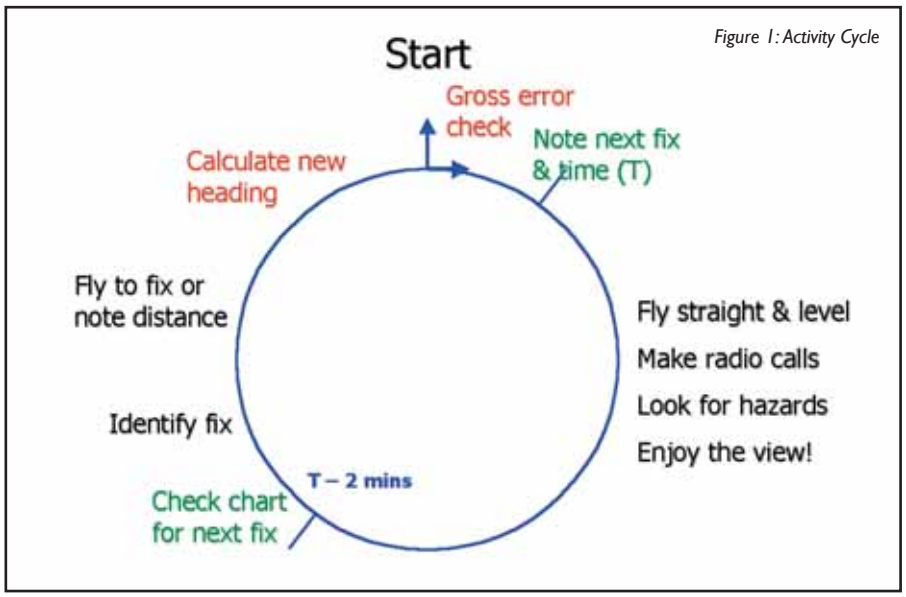


Figure 1: Activity Cycle

The in-flight activity (as illustrated in figure 1) should therefore be:

1. Set heading
2. Check for gross errors
3. Fly the calculated heading and height until the next 'fix point' is in sight
4. Regain track and make any necessary adjustments to heading or timing
5. Carry out a routine safety check and continue the cycle of 3 & 4 until a turn is needed

Routine Safety Checks

Routine safety checks are traditionally carried out every 10-15 minutes, and so would be carried out after every second fix point. These are generally accepted to be as follows:

F Fuel sufficient and as calculated, fuel tank selected appropriately
R Radio contacts as required, future frequencies set
E Engine, mixture set, carburettor heated
D Direction – Indicator (DI) aligned with magnetic compass
A Altimeter set to QNH (local sea level pressure) or as appropriate, note safe altitude
W Weather suitable around and ahead, note best direction for diversion if required

Turning Point

When the next fix point is a turning point, more time is needed to prepare for the next leg. Setting up the aircraft for the next leg in a rush after a late sighting of the turning point is a recipe for human error. There is of course no reason why the pilot navigator has to wait until he can see his turning point before preparing himself for the turn, but there is a natural reluctance to do so. The setting up ought to include a series of actions, which can be stylised in a 'WHAT' check.

Pre-Turn Checks

W Weather along track and best direction
H Heading from log or chart, look for a feature along that track on which to roll out of the turn
A Altitude to fly and minimum altitude from plog (pilots flight plan and log) or map
T Time expected to turn, reset watch if TP in sight

Once the turn has been completed, the cycle starts again with setting heading, ideally from overhead the point. We need to make checks every time we set a new heading which hopefully will identify any gross errors, and the same mnemonic can be used.

Post-Turn Checks

W Weather ahead
H Heading checked against log, sun and a major confidence feature
A Altitude achieved and safe
T Time - clock started, time for next event noted

Pre-Flight Phase

For the activity cycle to work properly, the in-flight phase relies heavily on the pre-flight phase. First the navigator must select the route to pass over or close to suitable fix points. Considerable time needs to be spent on map study to identify the most suitable fix points for the activity cycle and then to work out how they will be identified from the air. This can be done long before the required headings and timings need to be calculated using the most recent forecast conditions. If the desired route takes the aircraft through controlled or restricted airspace, which relies on suitable weather or ATC clearance, include planning for the worst case.

Method Summary

It can therefore be seen that the whole process consists of a sequence as follows:

1. Select route –
2. Study and select fix points –
3. Weather planning –
4. Set heading – WHAT –confirm –
5. Fly – lookout - look – seek – identify –
6. Regain track – recalculate –FREDAW –
7. Fly - lookout –look – seek turning point - WHAT –
8. Fly over turning point – Set heading – WHAT - confirm –
9. etc

In Part 2 of this examination, we will be looking at how GPS could be integrated and used within this navigation technique. Don't miss your next issue of *Navigation News*.

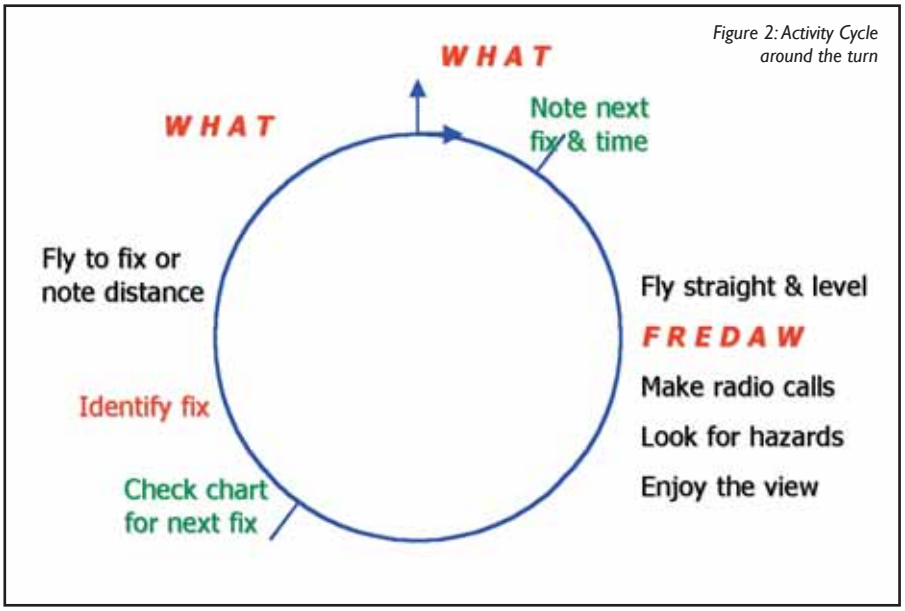


Figure 2: Activity Cycle around the turn

RIN 08: Your Conference Guide

The Date: 2-4 April 2008. The Place: The University of Reading. The Event: RIN 08, the premier animal navigation conference. Be there and discover how bizarrely impressive animals really are.

Animal navigation is one of the most fascinating areas of exploration in modern science. It encompasses orientation, migration, ethology, neurobiology, sensory physiology, ecology and entomology, and is also being used, through the branch of biomimetics, to provide answers to particularly human dilemmas. What we know about how animals navigate through their worlds is enough to bring the hardest cynic to slack-jawed wonder, and the amount that we still don't know about how and why animals get to and from their destinations makes animal navigation one of the world's hottest research environments.

The RIN, through the auspices of its Animal Navigation Group (ANG), has long been a champion of this cutting-edge research, hosting regular conferences to allow the world's top animal navigation researchers to meet, discuss, present their work and keep themselves up to date with what others in the field are doing to advance our understanding of animal navigation. This year's event, RIN 08, breaks the mould of previous conferences, and acknowledges the increasing pace of top-flight animal research. Professor John Kemp, chair of the ANG, explains.

'In the past, our animal navigation conferences have been held at four-yearly intervals. This was to give research teams time to conduct new experiments, so that there would be new results to report at each conference. However, in the 'wash-up' meeting that took place towards the end of RIN 05, we became aware that the pace of research in the animal navigation field had increased sufficiently that the interval between conferences should be decreased to three years. In particular in recent years, the miniaturisation of tracking systems has become a major factor, so that small animals and birds can now be tracked on their migrations and their daily movements. This has resulted in a huge increase in our knowledge of when and where animals actually go. Many of the findings are unexpected, so there is a great deal of exciting work involved in trying to explain why and how these movements take place.'

With the tide of animal navigation research so high, John is also hoping to see a resolution on the increasing vexed question of how animals and birds sense the Earth's magnetic field.

'There are a number of controversial papers on this topic, and it will be fascinating to see whether RIN 08 leads to any consensus amongst the opposing views, or whether these views become more deeply entrenched,' he says

So what can you look forward to at this year's premier animal navigation conference?

Highlights Of The Conference

A wise man – or altogether more probably a wise woman – once said that we can learn a great deal from the study of small things. Unsurprisingly then, RIN 08 kicks off on 2 April with a fascinating study of small things that also launches the question of perception of the planet's magnetic field. Bob Srygley from USDA-Agricultural Research Services asks whether leaf-cutter ants orient their path-integrates home vectors with some kind of magnetic compass.

'Leaf-cutter ants are ecologically and economically important, he explains. 'They are responsible for 17-20% of nutrient turnover in the Neotropics. They forage up to one-quarter kilometre from their nest beneath the tropical forest, where celestial cues cannot be used for orientation. We investigated their ability at night to use the geomagnetic field as a directional reference. We moved the ants to a chamber where the local magnetic field was reversed. In the natural field, the ants oriented directly towards the nest; but when the field was reversed, a significant proportion oriented in the direction opposite to the nest. Knowledge

of how insects orient can be applied to robotics and pest management,' he added, giving the paper a practical context.

Bee-n Here Before?

If there is one branch of the insect world that inspires more awe in human beings for its navigational abilities than ants, it is the bees, so it would be unthinkable for RIN 08 to ignore them. As well as a fascinating paper on orientation to artificial landmarks in nocturnal Indian carpenter bees, the first session of the conference features the work of Rudolf Jander and his team at the University of Kansas, which significantly enhances our understanding of the way in which honeybees navigate.

'We humans, honeybees, mice, and countless other animals skillfully know how to find our way around. For this, all we animals must, and do, share two basic capabilities: we have to recognise places to which we want or have to return and, in addition, we have to know how to move among known places in terms of directions and distances,' said Rudolf. 'Currently my team is focusing on place recognition. People recognise places mainly by attending to the constellation of distinct individual landmarks. Honeybees, instead, purportedly use memorised panoramic landscape memories, originally picked up as "snapshots" with their near omni-directional compound eyes. We asked the question - Could honeybees also attend to singled out, identifiable landmarks? We experimentally demonstrated that honeybees can identify a particular place by means of a single nearby landmark that we have made recognisably distinct by parallel black-and-white stripes.'

Third Eye Watching

Moving up into the kingdom of the lizards and amphibia, Augusto Foà will be presenting research on the capability of reptiles to perform spatial learning. Augusto will also tackle the external third (or parietal) eye possessed by lizards, the function of which has remained relatively mysterious. 'The discovery here was that the sun compass that lizards use to learn a new training direction only works if the parietal eye remains unshielded. And surprisingly, the normal, image forming eyes are apparently not involved in determining the sun disc position in the sky,' he says. Augusto's investigation into the wonderful weirdness of lizards is a paper you won't want to miss, but it sits in a session positively crammed with fascinating subjects – from homing behaviour in marsh frogs and the sensory biology of sea turtles to Rachel Muheim's case for bi-coordinate magnetic navigation in newts.

If, like Professor Kemp, you want to hear the finest researchers discuss the business end of magnetoreception, the afternoon sessions on 2 April will be your own little wonderland, including conceptual and chemical models of magnetoreception and also exploring the geophysical constraints on the biophysics of magnetoreception in a paper from Kirschvink and Walker.

The morning of day two at RIN 08 is literally for the birds. Gabrielle Nevitt has been using new technology to improve the world's understanding of how the albatross tracks prey by sense of smell.

'The work used GPS to track wandering albatross at ten second sampling rates as they were foraging at sea. Birds were also equipped with stomach temperature recorders so that the timing of prey capture could be recorded.

From the shape of the tracks we can infer that birds were tracking prey by smell roughly half the time. The other half of the time birds flew directly to prey items before ingesting them, suggesting that visual cues led them to the prey. On average we found that birds could detect prey from 2.5 km,' she explains. Gabrielle adds that her work on the albatross, in collaboration with Marcel Losekoot and Henri Weimerskirch, was the result of a fascination that had gripped her as a graduate student some 15 years previously. In this, she is fairly typical – once you get a nose for animal navigation research, it has a tendency not to let you go.

The second session on bird migration covers some equally gripping subjects, including the great circle migrations of Arctic birds and the results of orientation cage tests, as they apply to bird migration studies. Of particular interest is a paper from Vern Bingham from the University of Salzberg on migratory behaviour as a factor influencing the evolution of avian brain organisation.

'The motivation for our work is a curiosity about how the challenges of migration may have influenced brain evolution. Migration is associated with a suite of adaptations at the cognitive, behavioural and physiological level. Many of these adaptations would necessarily be associated with parallel changes in brain organisation to support them. By looking at relative brain volumes, volumes of brain subdivisions and neurochemical markers, we are attempting to determine how the brains of migrants may differ from non-migrants. To date we have focused on the old world stone chat and the new world lark sparrow. The species difference we have observed offers interesting insights into the factors that may determine how "migrant brains" evolve,' says Vern.

Deep And Meaningful

From bird brains, the conference next turns its attentions to creatures of the deep. Indeed, exactly what role depth plays in aquatic navigation is the subject of a paper from Peter Fraser FRIN. Like Gabrielle, his work, which involves hydrostatic pressure sensors and the search for the hydrostatic pressure sensor in animals without any gas compartments has its roots in a longstanding curiosity.

'My route into work on hydrostatic pressure sensors has been long and tortuous,' he explains. 'I started looking at neurones in crab brains as a PhD student and found an interesting set which responded to rotating the crab around separate axes. This pointed the way towards the balancing system which was highly analogous to our own semicircular canals. I worked further on this system with David Sandeman at the Australian National University between 1973 and 1975. While analysing the system further I found that small

changes in pressure in the blood system supplying the brain led to clear changes in activity in the same balancing system neurones. Later, back at Aberdeen University, I put an isolated balancing system inside a pressure cooker which was linked to a compressed air supply and I found that the sensory neurones responded to increases in hydrostatic pressure (ie pressure transmitted via a gas or fluid, acting all round a body). That was the easy bit.'

To get up to date with what Peter defines as 'the difficult bit' – including using data storage tags and high resolution sonar systems to narrow the knowledge gap on the role of depth in navigation, catch his presentation on day two at RIN 08. Other major papers in aquatic navigation in the same session include a dissection of three-dimensional orientation in fish form Robert Holbrook and Theresa Burt de Perera from Oxford, and an exploration of nocturnal orientation and object recognition through active electrolocation by Gerhard von der Emde from the University of Bonn.

Pigeons have long been famed for their homing abilities, making them a very popular subject for study in animal navigation. That means only the finest pigeon research has been selected for presentation at RIN 08, including Freeman and Biro's modelling of group navigation and another paper raising the importance of magnetic field variations, this time as a potential explanation for release site bias, from Mora and Walker from the University of Auckland.

Humans Are Animals Too

To cap the three day conference, we'll be taking a detailed look at mechanisms of orientation across the animal spectrum, a subject so diverse it's probably best summed up in the subtitle to a paper by Richard Holland of Princeton University. Looking at orientation and navigation in bats, the paper is subtitled 'Known Unknowns and Unknown Unknowns.' The session also offers delegates the chance to get their head around the deliciously counterintuitive "When Many Wrongs DO Make Right" – as Codling, Pitchford and Simpson explain the navigational benefits of moving as a group, and finally a reminder that human beings are animals too, with Roland Maurer from the University of Geneva investigating the use that humans make of path integration – or dead reckoning as we sometimes call it – throughout their lives.

'Path integration or dead reckoning, the process through which a moving agent can continuously compute its location based on its movements, is well-known to scientists who study the orientation of ants and honeybees, but, curiously, it is almost totally unknown to cognitive psychologists,' Roland

explains. 'Its importance for spatial cognition is being increasingly recognised, though; as evidenced by cells in the rat's brain that fire in a given location (hippocampal place cells), path integration helps to build a memory of the environment ("cognitive map") and to continuously update spatial representations, especially when visual cues are absent or ambiguous. I used to work with Ariane Etienne on path integration in hamsters as early as 1979, and I now want to know more about path integration in humans, as, for example, nothing is known about its development in children.'

RIN 08 promises to be a fascinating event no matter what your interest in animal navigation, and as John Kemp says, despite the wealth of wonder that will be presented by speakers and posters across the space of three days in Reading, it's not all about the work.

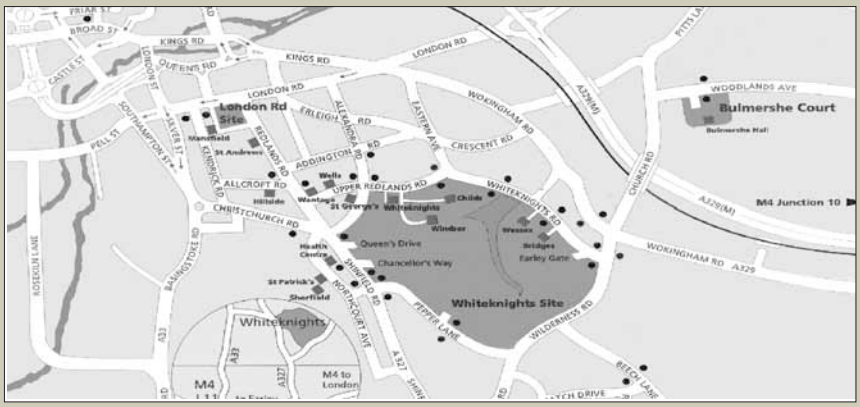
'The RIN series of animal navigation conferences is unique because it provides the only opportunity for researchers from many parts of the world in this field to get together in one place. Hence the importance of the social aspect. By holding the conference on a University campus and including all meals and a bar facility until late each evening, there are continuous opportunities for delegates to meet and interact throughout the whole duration of the conference.'

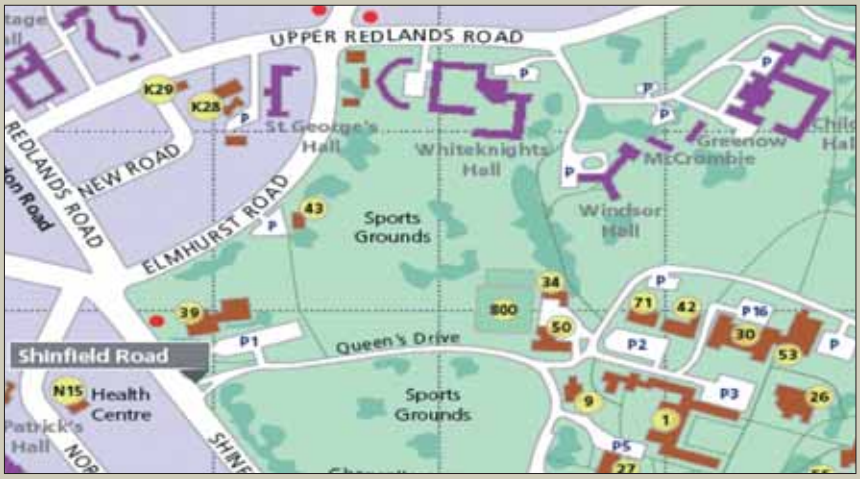
You heard the man – see you at the bar!

In Case of Animal Navigation Failure

Human beings are animals with particular navigational skills, but just in case those skills should desert you at any point during the three day conference, the University of Reading has provided maps and emergency contact details.

The University Halls of Residents Reception Desk: **+44 (0)118 378 8800**
Emergency contact number for the University Campus (24-hr) : **+44 (0)118 378 7799**
Emergency contact number for the Royal Institute of Navigation: **+44 (0)7767215512**





Secrets of the Nile

John Kemp is not a man to take a holiday lying down. In March 2008, he took what was supposed to be a cruise down the Nile from Luxor to Aswan. Being a typical RIN member, he was soon on the bridge, where he learned that the Nile has navigational, as well as historical, secrets to impart.

It began as a simple project to find out how the cruise ships that run up and down the Nile were navigated. The M.S. *Serenade* was a typical cruiser at 72 metres in length, 1.6 metres draught and four decks extending some 10 metres above the waterline. She was driven by 3 Volvo Penta diesel engines with an 'Aquapilot,' lever control for both throttle and direction of thrust of each propeller. An electronic display indicated the orientation of the thrusters, but there was no wheel as such and, in fact, no rudder. Full speed was 22 kilometres per hour (km/h) which, with a 4 km/h current, gave 18 km/h over the ground upstream and 26 km/h over the ground downstream.

Having made my project known, we were graciously invited into the (wheel-less) wheelhouse by Captain Morsy and Captain Fathy, while our marvellous tour manager, Caroline Fayez, kindly and fluently interpreted all my questions and their replies. The two Captains alternated their duties throughout the cruise, Captain Morsy having the conn at the time of our visit.

Captain Morsy explained that a chart would be of little use because the navigable channels were changing all the time.

'So how do you know when a new shoal develops?' I asked.

It was by the appearance of the water surface, he said, and, indeed, even I could see this in extreme cases. The Captains, with their years of experience, were much more finely attuned to the wave patterns and other cues that gave warning of depth fluctuations. More skilled perhaps even than the Ancient Egyptians, whose craft are often depicted with a bow-man probing the depth of water with a sounding rod, or even (from 1500 BC) with a lead and line.

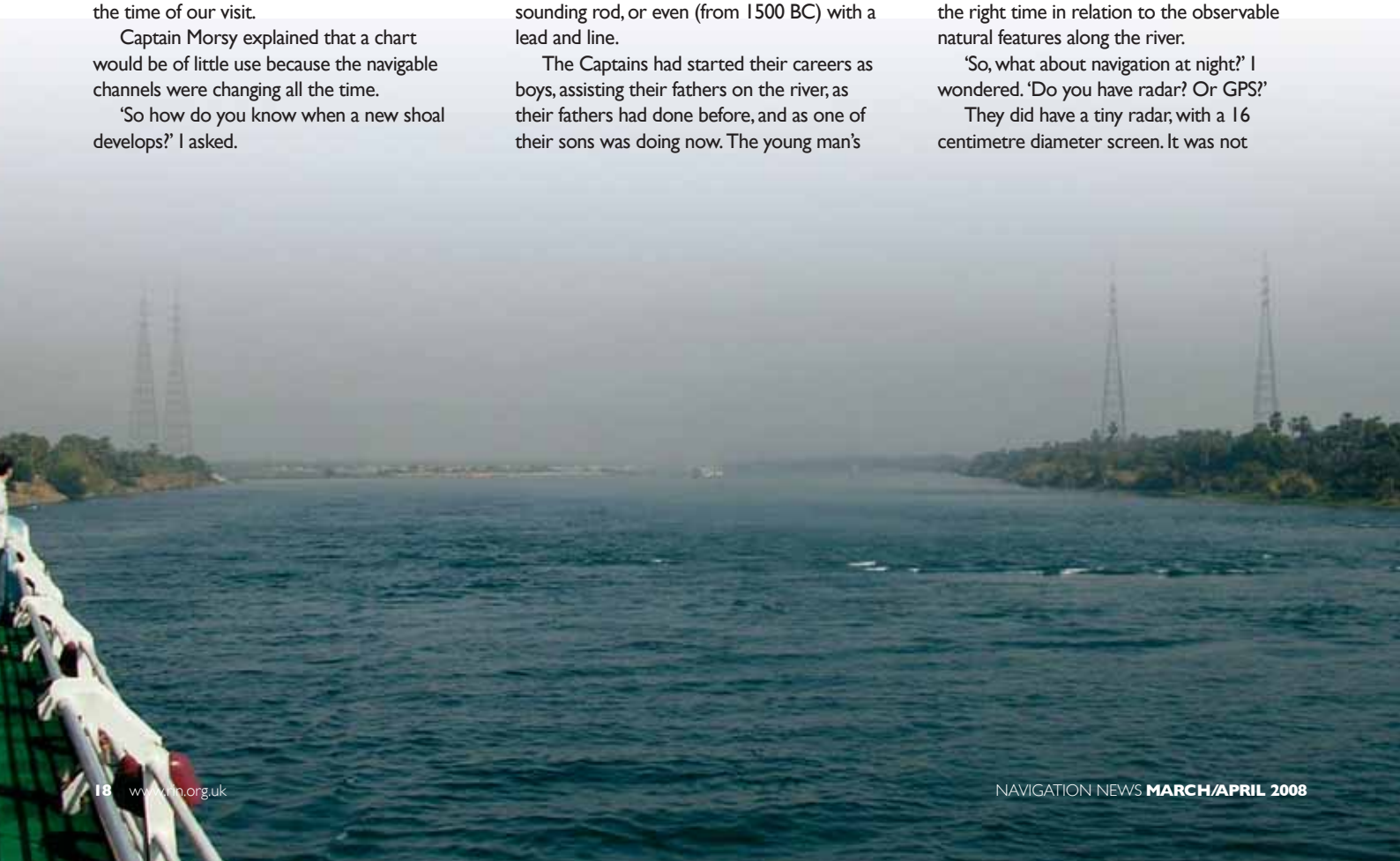
The Captains had started their careers as boys, assisting their fathers on the river, as their fathers had done before, and as one of their sons was doing now. The young man's immediate duty was to serve us with glasses of piping hot tea. He was learning the virtue of kindness to strangers from his courteous, and multi-talented mentors, as well as learning the ways of the Nile.

To say that the Captains carried a chart in their heads is no exaggeration. They each had a lifetime of familiarity with every feature of the River and were immediately conscious of even the smallest change. There was little else to help them with their task. There are no aids to navigation on this stretch of the Nile. No buoys, no shore lights – nothing.

Certainly, to someone without their experience, the courses they chose were not at all obvious. It was not always a case of keeping to where I would have expected the deep water to be - at the outside of bends for example. And sometimes we passed very close to the shore on the inside of islands, which to my uneducated eyes seemed a positively dangerous course of action. At least, during daylight, it was possible for a Captain to place his ship visually in the right place at the right time in relation to the observable natural features along the river.

'So, what about navigation at night?' I wondered. 'Do you have radar? Or GPS?'

They did have a tiny radar, with a 16 centimetre diameter screen. It was not



observable from the conning position and it was heavily screened so as not to interfere with the Captain's night vision. It was hardly ever used, they said. There was some discussion (limited by the language barrier) as to whether a small handset, mounted on the forward bulkhead and also heavily screened, might be a GPS, It did not *look* very much like a GPS, but the matter was rendered rather academic since it was never used.

Navigation at night, it seemed, was conducted by observing the faint sheen of the water and the loom of the riverbanks to estimate position. There were also powerful searchlights mounted on each bow. One of these could be flashed on for a few seconds at a time to illuminate the nearest bank. To the uneducated eye, this simply gave a snapshot of more palm trees, but it was instantly recognised by the Captain so that he could verify his position. The duration of a flash was never long enough to impair his night vision.

Something else was worrying me. How did they govern collision avoidance – surely a very frequent requirement with so many ships on a relatively short length of the river. On most European waterways, ships keep to the starboard side, but the Nile cruisers, when they meet, seem to pass green-to-green as often as they pass red-to-red.

'How do you know which side to pass?' I asked.

'It is the ship that is heading downstream that decides,' I was told. The decision, it seems, can be communicated by VHF, by whistle signals and by observing the aspect of an approaching ship. This observation of aspect is not as straightforward as one might expect. The only masthead light is shown from a short mast, which is folded when passing under bridges. Green and red sidelights are carried, but they are not externally screened to prevent them being seen on the wrong bow as is the case for deep-sea ships. On deep-sea ships, a screen extends forward of each sidelight for about a metre, and this prevents a sidelight from being seen more than about 1½ degrees on the opposite bow. My own subjective estimate was that a sidelight on a Nile cruiser could be seen a good 15 degrees on the opposite bow.

The pre-1974 COLREGS explicitly stated that the rule for ships meeting does not apply when both green and red sidelights are seen anywhere but right ahead, but it would clearly be unwise to rely on that statement when navigating on the Nile. A close green-to-green passing is a scary thing for a deep-sea navigator - especially when both sidelights of the other ship can be see right up to the last minute!

Although whistle or horn signals were available for arriving at passing agreements in theory, they appeared to be used, in practice, exclusively to exchange greetings between ships in the act of passing.

That left the matter of reaching a passing agreement by VHF. This seemed to incur the same risk as making VHF contact for this purpose at sea. That is, the risk of addressing a ship other than the one that is intended. The language barrier again made it difficult to put this question across. However, the answers given were that the Captains of the *Serenade* knew the Captains of all the other cruisers, and the positions of their ships were regularly reported by VHF to the River Police. This would clearly have been important information but, with five or six ships at a time in close proximity, it did not seem enough. However it is done, collision avoidance is conducted with great efficiency and, it has to be said, in terms of passing distances, with great panache.

'Do you have a chart of the River,' I began

Ship control is another area where Captain Morsy and Captain Fathy excelled. With high, slab sides and a small draught, the effect of wind on their ship is huge. Controlling the front end of the ship in a fresh breeze was a circumstance crying out for a bow-thruster, but none was fitted. Berthing and unberthing operations, which often involved many ships manoeuvring in close proximity were, nevertheless, carried out with great precision. Similarly, entering the lock and shooting the swing bridge at Esna were real 'cork in a bottle' operations but carried out with superb judgement by the Captains.

Navigating a Nile cruiser is not a job for the faint-hearted. The intricacy and the variability of the navigable channels, and the absence of navigation marks, form one challenge. The nature of the tourist industry means that many cruisers compete to be in the same place at the same time, and the consequent heavy concentrations of traffic create another challenge.

My own feeling is that fitting bow-thrusters to the ships would be a useful facility. Otherwise, it is hard to see how more sophisticated instrumentation could improve upon the highly effective navigation routinely carried out on the basis of experience and memory by Captain Morsy, Captain Fathy and their colleagues in the fleet of Nile cruisers. When it comes to safely navigating one of the world's greatest rivers on a regular basis, it seems you either know the secrets of the Nile, or you don't.

My thanks are due to Captain Morsy and Captain Fathy for their gracious hospitality, for answering all my questions, and for allowing me to take whatever photographs I liked. Also to Caroline Fayez for taking time from her many other duties to act as such an efficient and patient translator.

Equipping An Expedition

Steve Cater is probably the Institute's most frequent, and possibly its most prolific, 21st century land-navigating explorer. Reports of his exploits in *Navigation News* may have given readers the impression that he's mad as a box of frogs. Here, he explains the method to his madness, and shows the levels of planning required by any navigator who wants to go adventuring – and come back alive.

The choice of equipment to be taken on an expedition is governed largely by two factors: the type of expedition planned and the budget available. Our latest plan was to travel overland from England to the Moroccan/Algerian border, venture a short distance into the Sahara to a point identified some years previously as being 'an interesting place to spend a few days,' and to return to England. The major constraints were time – the expedition had to take place between 23 December 2007 and 4 January 2008 – and money.

Though the possibility of undertaking such an expedition had been bubbling away in our minds for some time, it was not until late November 2007 that circumstances combined to allow us all to commit to it and thus the time available for detailed planning and preparation was short. In terms of budget, £1,500 was the nominal amount agreed upon and this cost was to be borne equally by all the three members of the expedition. The combination of these factors meant that we were very much limited to utilising equipment already to hand, to minimise preparation time and ensure the available budget could be devoted to fuel and other expenses, rather than capital equipment. For planning and preparation, the important items to consider were therefore broken down into:

- Vehicles and off-road equipment
- Shelter
- Personnel
- Water/food/supplies
- Navigation

Vehicles And Off-Road Equipment

The need to use an existing vehicle ruled out the possibility of building our long-planned and minutely-debated dedicated off-road kampfwagen, based on either a Forward Control 101 Land Rover or a Pinzgauer. The vehicles we realistically had available to choose from were:

- Land Rover Series 2a SWB V8 petrol
- Range Rover Classic 2.5 Tdi diesel
- Range Rover Classic 6.2 GMC diesel

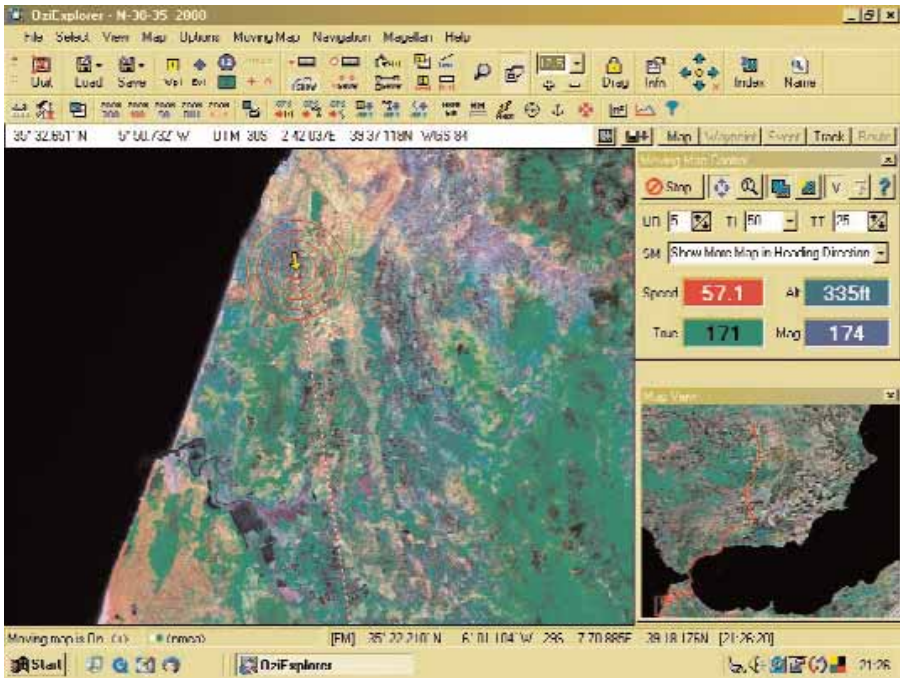
The oldest of the vehicles on the list, the short wheelbase Land Rover, was also perhaps the least suitable for this particular expedition. Currently part way through a major renovation programme which will eventually see it emerge as a dedicated 2 man Pathfinder vehicle, the Landy could have been

rushed into use for this trip but would have suffered from a shortage of space and carrying capacity. In addition, its V8 petrol engine, though eminently reliable and easy to maintain - and with plenty of power in hand for driving through power-sapping soft sand, has a voracious thirst for fuel. Given that we planned to cover some 4,000 miles in around 10 days, budget considerations stacked up against the Landy too and it was relegated from contention.

Just like the Landy, neither of the two Range Rovers we potentially had to choose from was particularly standard. The older, a Classic two-door, is our dedicated mud-plugger: optimised for driving off-road in the deepest of mud, ice or sand. Augmenting Lode Lane's OEM centre differential lock, which locks the front and rear prop shafts together to provide drive to both axles in loose mud, are two additional axle differential locks. On the rear axle is a Detroit Locker, which locks the two rear halfshafts to ensure a spinning rear wheel cannot deprive the other of power, and a similar arrangement utilising a True-Trac locker on the front axle is intended to provide the same capability to the front two wheels. Together, these three differential locks comprise our 'Invincibility Drive' and should ensure that no matter what the terrain – ice, mud or snow, at least one wheel (and hopefully all four) will still be driving! Naturally, this enhanced traction control enables us to venture further into the mud than is frequently wise before we become totally stuck – weighing in at over two and half tons the Rover isn't actually buoyant[1] – and so it also sports an impressive array of recovery equipment. Foremost amongst these 'destuffing devices' is a hydraulic winch driven by the power steering system. There is much debate among the off-road driving community about the relative merits of electric versus hydraulic winches with most opting for electrically driven devices. Among our group there is no debate: the hydraulic winch is heavier, more expensive and slower in operation but reliable, powerful and doesn't kill batteries.[2] The Rover is powered by a 6.2 litre diesel engine, a simple, low-revving beast with massive torque but a little thirsty (25 mpg) and occasionally prone to cooling problems in the narrow confines of the Range Rover engine bay. That, and the fact that the Rover is again only a two-man vehicle, eliminated it from contention for this trip.

Odin Rides Again

That left us with our expedition-optimised vehicle – Odin, a four door, 1983 Range Rover powered by a Series 300 Tdi diesel engine. Capable of up to 35 mpg, wholly mechanical in operation, with adequate torque and reasonable power, the engine was clearly best suited to our fuel budget! The vehicle was a true three-seater, the standard rear bench seat having been replaced by a single seat for the navigator, a fridge and a rack for carrying up to four 25-litre jerry cans and a water purifier. The rear luggage compartment has a welded wire mesh cage within it for security and usually transports personal luggage, vehicle spares, a range of recovery equipment, tables, chairs and a cooker. A roof rack provides space for a folding tent, tyres and additional jerry cans if required. Our preference is for older vehicles rather than more modern equivalents: we willingly sacrifice luxury and absolute performance for reliability and an ability to repair things with a hammer. The existing fuel tank has been augmented by a couple of long-range tanks, giving close to 140 litres of fuel without resorting to jerry cans. Standard procedure for us on entering remote areas is to carry full integral fuel, plus three x 25 litre jerry cans of water and one x 25 litre can of diesel internally. More jerrycans of fuel can be carried on the roof rack or bull bar *in extremis*, but that entails a fine balancing act, trading off weight and vehicle stability against extended range. Fully laden, the Rover can weigh over 3 tons and so the suspension has been uprated accordingly with Old Man Emu heavy-duty springs and dampers. Tyres are BF Goodrich All Terrains, a tyre with a reputation for toughness and longevity – important when traversing flinty desert! We usually run the tyres at 35 psi on tarmac, but frequently reduce the pressure to around 25 psi when on soft ground, increasing the size of the contact patch to spread the load. In really soft going, the tyre pressures are often reduced to as low as 20 psi (occasionally, even 15 psi) to prevent bogging. As pumping tyres manually, several times a day, in hot Saharan sun is not something to be undertaken lightly, the Rover is also fitted with a heavy-duty 12V compressor and airline.



A screenshot from OziExplorer showing our position and route being plotted on satellite imagery in real time as we travelled across northern Morocco. The interface offers many options for customisation.

Shelter

For shelter we generally use tents for portability and convenience. We have a variety to choose from, each suited to a particular environment: some small one-man tents ideal for individual back packing or cycling, others able to support two people in extreme Arctic or mountain conditions, and yet another capable of providing accommodation and a communal area for up to 8 people in desert environments. On this occasion we elected to make do with the two-person roof tent that is both carried and deployed on the Rover's roof for Ben and Emma, and a portable aluminium camp bed for me. I'm not averse to sleeping out under the desert stars, particularly when snuggled inside two Arctic issue sleeping bags! The roof-mounted tent is by Eezi-Awn of South Africa, suitable for both hot and dry or cold and wet climates. It can be deployed or packed away by one person in a matter of

[1] It is however equipped with a snorkel…

[2] On one particularly memorable occasion, we watched in amusement as a Land Rover became bottomed out in deep mud at a quarry at Tong, Yorkshire. With knowing looks, we reversed up to a point nearby and as one of our crew began to spool out a hundred feet of winch cable a second began to attach anchor straps to the rear chassis member to stake our Rover firmly to the ground. A third crewmember fired up the portable barbeque. Two Land Rovers equipped with electric winches raced up to the stricken vehicle, smiled at our elaborate but 'unnecessary' preparations and promised to have the vehicle free before we had even finished unspooling our cable. Thirty minutes later, as we dined on steak and onion sandwiches, the stricken vehicle was pulled effortlessly from the mud by our winch while the owners of the electric winches ate humble pie, one with a burned out winch and the other a boiled battery.

minutes, and can be stowed with mattresses, sleeping bags et cetera within it. It places the occupants high above ground and thus equally above local wildlife. Its disadvantages are that it increases both the top weight of the vehicle and aerodynamic drag. In addition to camping in the desert, we also planned to stay at a Kasbah or two in Morocco, and at Formule 1 or similar low cost motels in the run across France and Spain should the weather, or surroundings, be too unpleasant for camping.

Water/Food

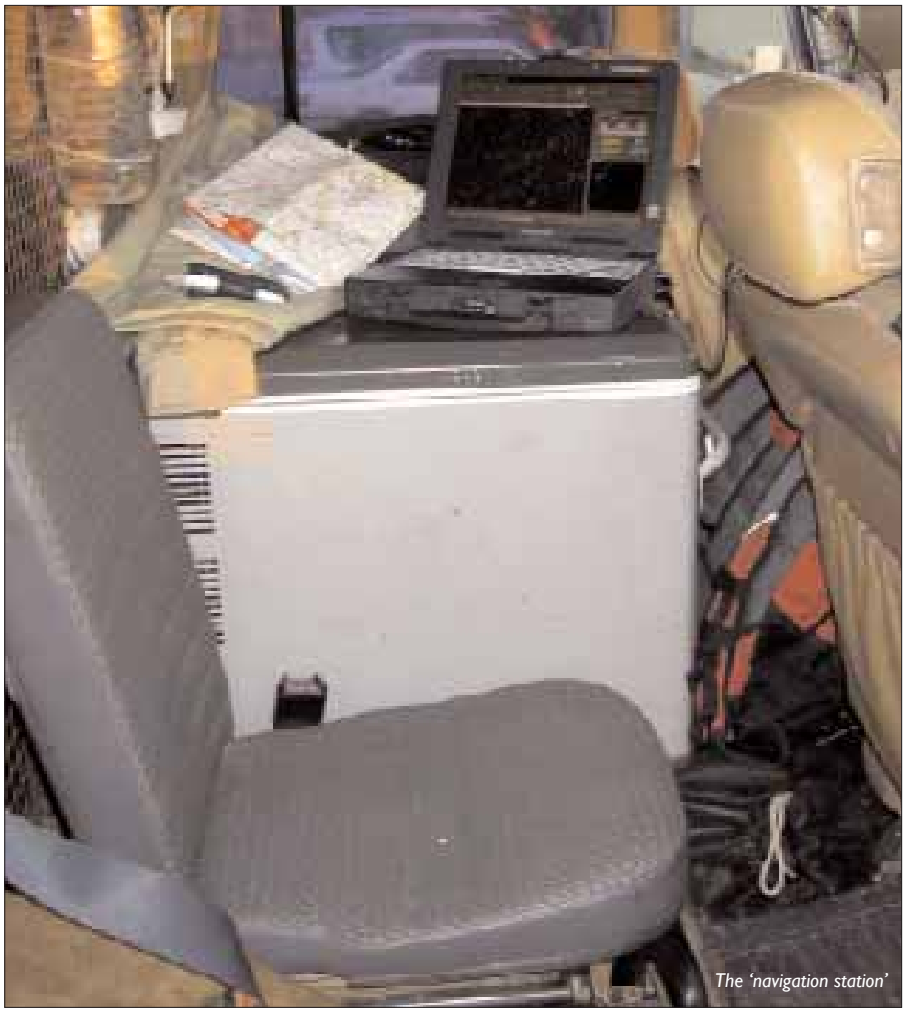
The water we carry with us and/or obtain en route is stored in black plastic jerry cans – the darkness inhibiting algal growth – and is in any case treated with iodine. Before drinking, the water is passed through a ceramic/silver/carbon filter system to remove particulates, kill bacteria and virii, and remove toxins. Including the iodine.

Food stores generally comprise a selection of tinned or dried meats, fruit and vegetables, all augmented wherever possible by locally purchased fresh produce. Eating local delicacies is one of the great experiences associated with travel, though in the case of such epicurean delights as pickled snake brain, goat's heads, rat or other sundry dead things on sticks it sometimes helps not to be able to identify it until after digestion has been fully and safely accomplished. In North Africa and most of the Saharan region food can be bulked out with what we believe to be a form of the Elven bread that sustained Frodo and Samwise all the way to Mordor: a flat, round, fibrous cake of wheaty dough that has the absorbency of talc, the toughness of rubber and a taste all of its own.

A real luxury is the 12-volt Engel fridge freezer installed right next to the navigator's station. Utilising a swing motor compressor rather than the cheaper but less reliable and efficient conventional compressor/evaporator system, it can freeze liquids in even Saharan heat. It also makes an excellent table on which to plot courses and balance the GPS/laptop while of course ensuring that the navigator is never more than 10 seconds away from a refreshing chilled drink of, er, water. It's also conveniently and annoyingly out of reach of the driver for those occasions when the navigator has thought to stock it with something more appealing than water.

Expedition Members

Be it for an expedition to the Pole, a flight to the Moon or a three-year marine circumnavigation of the world, organisations go to great lengths to determine and select the ideal candidates with which to staff it. Psychiatrists are consulted and runes read: what is the ideal combination of skills, temperaments and personalities needed for optimum performance? What personalities are best suited for a desert crossing requiring three people to live in the close confines of a cramped, bouncy, fume ridden metal box for 14 hours a day? Could you spend two weeks living with an argumentative, arrogant, know-it-all perfectionist? I have to, and that's just when I'm travelling alone. My view is that anyone who can tolerate me is probably unhinged enough to make a great travelling companion - undoubtedly having adequate foibles of their own to distract them from enquiring too closely into mine. If they have an inability to understand the concept of defeat, can shoot, skin and cook small furry things and laugh in the face of adversity (and authority), so much the better. They're of the right stuff.



The 'navigation station'

Navigation: Equipment And Planning

Navigation was one of the most important issues to be faced on this expedition. The site where we proposed to see in the New Year of 2008 was chosen some time ago from a satellite photograph of the northern Sahara on the principle that it 'looked interesting,' would be acceptably warm and would present a suitable challenge to reach. Oh, and we weren't sure exactly where it was, politically at least. Though its latitude and longitude could be ascertained readily enough, and a route to it planned, whose jurisdiction it fell under was less certain. Some maps show it as belonging to Morocco, others to Algeria. The Polisario claim it and our Michelin map, politically neutral, just marked it as 'interdit'. As navigation was to be my primary role in the expedition it seemed a good idea to me to be able to pretend I knew what I was doing, or at least have an impressive array of kit I could blame for being in the wrong place at the wrong time if necessary. In addition to paper mapping, I therefore decided to take a handheld Magellan Meridian Color Pro GPS unit interfaced to a laptop computer running mapping software.

Laptop

The laptop chosen for the expedition was a Panasonic CF-27 Toughbook, a ruggedised, water resistant computer which could withstand the rigours of being bounced around in a Rover for a couple of weeks. A now obsolete model, it would have cost well over £2,000 when new in 2002 but on the current second hand market was available for

only a few hundred pounds because of its relatively low specification when compared to newer models. Though a 300 MHz Pentium processor with 128 Mb of RAM memory might seem very modest by today's standards, it is quite adequate to run most mapping programmes. The existing 10 Gb hard drive was replaced by a newer model with a capacity of 80 Gb in order to allow full earth coverage of NASA's LandSat satellite images to be stored on it in compressed SID format. Three operating systems were loaded: BSD 6.1, Linux (Xandros) and Windows 2000 – the last being old enough for most of its bugs to have been ironed out.

OziExplorer Mapping/ GPS Software

Being a Yorkshireman, I'm genetically hardwired with an aversion to paying for anything, but OziExplorer is an exception: it really is *that* good. Microsoft could learn lessons from its ease of use and appropriate functionality. A free version is available for trial and evaluation (taking notes Bill?) but I defy anyone to use it for a serious expedition and still not believe that paying to register it is the right thing to do. OziExplorer was developed by Des Newman to allow a user to import a scanned map, nautical chart, aerial photograph or satellite imagery into the software, calibrate it and then use it as the basis for navigation. The software can interface with most commercially available GPS receivers and uses their NMEA output for almost real time tracking and navigation functions. Routes can be plotted on the software and then downloaded to a linked GPS unit for independent use. OziExplorer's full capability would take too long to describe here[3] but suffice it to say that for overland expedition use, nothing else I have tried comes close under £1,000. OziExplorer costs around £50 for an electronic download from www.oziexplorer.com and will run on very modest computers. The software has also been designed for marine-based activities and has many features built into it for this purpose.

Magellan Meridian Colour GPS Unit

My Magellan Meridian Colour GPS unit is now four years old. A ruggedised (the more astute reader can probably spot a theme developing here…) model purchased in 2003 for service in Iraq, it has subsequently more than proven its ability to survive whatever I can throw at it. It does though have a voracious appetite for batteries compared with more modern units using the latest low-energy chipsets, a pair of alkaline AA lasting only for around six hours and considerably less than that if the screen backlight is used often. Time to establish a fix from a cold start is pretty good, generally of the order of a minute or so, and only a few seconds after a hot start. It has the ability to connect to an external antenna – a facility we made use of by mounting an external antenna on the roof of the Range Rover – and to a computer via a serial lead. This unit, linked to the pc running OziExplorer, provided the main electronic navigation capability for the expedition.

Garmin GPS V

The driver elected to take a second GPS unit on the expedition, a Garmin GPS V that was mounted on the dashboard. Relatively new, it was loaded with detailed maps of the European road system and was able to provide turn by turn route directions until we reached the Straits of Gibraltar. We had no compatible electronic mapping of Morocco and so used it as a conventional position-fixing unit to double check against the primary system once across the Straits.

G-Ray GPS Data Logger

For this expedition, the RIN loaned us a couple of small G-Ray GPS data logging units so that we could track our progress independently of the other GPS units. No larger than a matchbox, the data logger stores the position fix from its internal GPS chipset to a rolling buffer which can subsequently be downloaded to a computer by a standard USB link. According to the manual, the unit can output NMEA data to a PC via the USB link and so should also have been able to drive the OziExplorer software but we were not able to take any meaningful NMEA data from the unit.

Maps

Paper maps don't eat batteries, can be read almost instantly and are often easier to interpret than their electronic counterparts. Added to that, they can easily be drawn on, have a variety of non-navigational functions that their electronic counterparts simply can't rival, and look pretty. We took several, giving us a wide choice of borders in case we were accused of being somewhere where others would rather we weren't. Of most value once in the desert were a couple of air navigation charts, their emphasis on terrain features, contours and heights proving very useful in an otherwise relatively featureless landscape. They may also have had the most accurate representations of borders…

Navigation Station

For some 4,000 miles I was ensconced behind the driver in what we termed the 'navigation station', peering intently at the laptop display balanced on the fridge much as I imagine those pioneering pathfinders of the 1940s huddled over their H2S and Oboe sets. I think it takes a particular kind of mind to spend long cramped hours in a windowless compartment[4], checking the paper map against a digital display, trying to calculate new headings faster than a silicon chip and taking great delight in any topological discrepancies. My colleagues agree and assert that I do indeed possess a very peculiar kind of mind.

A moving map display was generated on the laptop, being fed position data from the GPS unit positioned on the driver's headrest. An external GPS antenna was mounted on the roof rack to give it the best possible view of the satellite constellation. The fridge provided warmth (the evaporator/condenser system vented directly against the seat,) a plotting table for paper mapping and enough alternative discomfort (elbow room was non existent) to take my mind off the lack of leg space.

So Much For The Equipment, What Of The Plan?

Our plan was relatively simple: drive across France, Spain and Morocco, head out into the Sahara, spend a few days in the sand while everyone else was eating turkey leftovers and then return home. Departure day was 23 December and we needed to be back in the UK by 4 January, having covered around 4,000 miles in the interim. An 'X' was marked on the map, fuel usage predicted so that we had the bare minimum in the tank consistent with safety until we reached Morocco (where diesel is very significantly cheaper than in Europe), and the vehicle loaded with supplies. Two hours before dawn on December 23rd we scraped the frost from the windscreen, climbed aboard and turned the ignition key. The engine roared into life (much, we imagine, to the annoyance of Ben's neighbours) and we were Sahara bound…

[3]A more detailed overview of the software was given in the July/August 2004 issue of *Navigation News*. The current version of the software is even more capable, and can now import and calibrate NASA's SID format satellite imagery automatically.
[4]The rear windows of the Rover were blacked out, allegedly for security and to reduce solar heating of the vehicle interior. I harbour a sneaking suspicion that my compatriots simply didn't want to be seen in my company.

'Following Yonder GPS Blip'

What happened next? Was all the planning sufficient? Did our three kings…well, two kings and a queen of Occident…find their way into the desert for Christmas? Did 'RINdianna' Cater and his compadres ever find out which side of which borders they were actually on? Is navigation from a fridge-top really possible? Watch this space…

MAILBOX

Galileo – Cheaper Than Northern Rock

Loth as I am to dispute with our learned President I feel he went a little too far in his criticisms of Galileo during his opening speech at NAV07. In particular I must take issue with David when he says:

'Independence has proved to be a myth. The mass market demanded technical compatibility between Galileo and GPS, not a separate and different Galileo. And US national security blocked Europe's freedom to operate Galileo without US co-operation. So free-to-air Galileo has become essentially another version of GPS.'

I'm afraid he misses the real point of independence and rather confuses things by claiming that technical compatibility means independence is impossible. Actually, it would matter not a jot if Galileo were absolutely identical to GPS in all technical respects; what is important is *who controls it*? The indisputable fact is that GPS (and, for that matter, Glonass and Beidou) is a military system under the total control of a (to the EU) foreign military power. That does not matter for military purposes. Where it does matter, very much indeed, is whether it is the intention to use it for civil purposes *that require legislation*. If it were just a simple matter of providing us all with another 30 satellites to plug into our in-car navigation systems then he might have a point, but it is not.

I am told that within the next few years not a car will be made without satnav built in; hardly a light aircraft flies or a small boat sails without it; my daughter, a keen fell walker, tells me no-one ventures on the mountains without one; practically all cellphone transmissions are synchronised to it, and so on. These applications are all very well but no legislation attaches to any of them - no-one tells these users that they MUST use it on pain of breaking the law. Therefore, if GPS were 'switched off' tomorrow, whether by military denial measures or not, there might be a lot of complaints about the dastardly Americans but there is absolutely nothing anyone could do about it.

On the other hand, if it were proposed to use a GNSS as a primary system for air navigation, that is, a system all commercial aircraft would be required to carry by law, as they do VOR, DME and ILS today, then it is a completely different picture. Liability for the correct operation of such systems lies with the contracting States; if they do not work, or, worse, give misleading information, legal recourse can be had directly to the State concerned. Extremely complex safety cases have to be made out for every detail of their operation, involving inspection of all aspects of their design, operation, control and maintenance. Being military, it is simply not possible to do this with GPS since only those details of its operation considered safe to reveal are in the public domain. USAF Space Ops will not divulge to even the most high-falutin' international organisations the fine details of exactly how GPS is controlled from Schriever AFB. Of course, this also applies to GLONASS – the Russians are even less forthcoming.

Since the potential benefits of GNSS are so great, there is only one answer, and that is a truly international system owned, operated, and controlled by a civil organisation willing to meet all the requirements for a fully-traceable system. That is one of the major drivers behind Galileo, and one that is studiously ignored by its critics. It is true that getting 26 different countries to agree on anything is a major problem but attempts to do so in such an important area should not be derided.

And a word as regards cost. The current cost of Galileo is quoted at £1.7Bn, so let's double it to £3.4Bn just to be realistic. It seems a lot of money until it is compared with the fact that the EU does not know the true cost of its agricultural budget to better than £20Bn, and the UK itself has a grey area of 'unallocated resources' in its annual budget of something like £25Bn. Perhaps a mere £3.4 Bn on something that might actually prove useful is not too bad a bet! In any case the UK would only pay around 17% of this cost (0.5 Bn); compare that with the £30 Bn (and counting) apparently immediately available for banking crises like Northern Rock.

Walter Blanchard

The Journal of Navigation – the April 2008 issue

You should be receiving this issue of *Navigation News* just as the April edition of the *Journal of Navigation* is being delivered. What a multitude of choice articles and papers to read!

By turning to the last paper in the Journal you will be able to find the final answer to a query first raised in the Journal in May 2004 that highlighted an examination question posed to Air Transport Pilot Licence candidates by the Joint Aviation Authorities. The original piece on the cross track distance between a Great Circle route and a Rhumb Line at the mid-longitude point sparked considerable interest and some of the suggestions have been published in the Journal – many have not. Paul Hickley, who wrote the first article, now closes off the topic with the definitive answer – I hope it will not be the cause of an International diplomatic incident!

Staying with the aviation world, turn to Peter Brooker's detailed criticism of the existing cost benefit analysis of SESAR, the Single European Sky Air Traffic Research System. He highlights significant concerns about the productivity of European air traffic services and whether the published discussion papers will provide the accurate and best guidance for European decision makers when they ponder the future of air traffic in Europe. Lee and his team from Korea and Australia report on flight trials examining the performance of a GPS/pseudolite/INS system during aircraft approach and landing.

There are six papers dealing with maritime topics, ranging from worries that the merchant fleet's dependence on modern electronic navigation aids has led to a reduction in watch keeping skills, through an analysis of an 1878 collision on the River Thames, to a new method of collision avoidance and ending with papers on GNSS/INS integration and low cost GPS in maritime navigation and survey. The final maritime paper uses vector analysis for sight reduction in celestial navigation.

Land based navigation is the background for a paper on a calibration procedure for MEMS inertial sensors and a paper on the role of 4000 taxis in the Intelligent Transportation System used in Shenzen, China.

Satellite systems receive attention with suggestions how best to model tropospheric delay in GPS signals, and explain a novel technique to deal with the interference caused by DME/TACAN signals in the E5/L5 frequency band of the new generation of GNSS. There is also a feasibility study for a regional navigation transceiver system capable of competing with GNSS.

All these papers can be found in the April edition of the Journal – check out your copy today.

Affiliate Organisation – South Tyneside College

South Tyneside College is a world-renowned centre of excellence for marine education and training.

Established almost 150 years ago as a Marine School, it is the only college in the UK to gain 'National Nautical Centre of Excellence Status' from the UK Government, in recognition of the exceptional quality of its marine and nautical training.

Today, the college caters for nearly 3,000 full-time and over 18,000 part-time students, who study hundreds of different courses and subject areas.

Within marine education, the college offers a wide range of courses in navigation, engineering, communications, survival/seamanship, catering and hospitality including Officer Training programmes, Certificate of Competency courses and Degree Level courses.

It also works regularly with many of the key industry players to develop bespoke courses.

Since its very inception, the College has responded to the requirements of maritime training and education. It boasts an impressive list of industry firsts – one of which is the introduction of IALA (International Association of Lighthouse Authorities) approved training for VTS (Vessel Traffic Services).

VTS operators expedite the passage of vessels in and out of ports in order to safeguard shipping and protect the marine environment. Working closely with MCA and Port Authorities, the College developed the first ever VTS training programme with MCA recognised accreditation.

In conjunction with the MCA, the College also developed national occupational standards for VTS in the United Kingdom.

The College's working relationship with the MCA extends to providing courses which update knowledge including the MCA Nautical Surveyors Refresher Course and the MCA Navigational Equipment Awareness Training.

Navigation training at the College includes Navigation, Radar and ARPA Simulation – Operational and Management, Operational Use of ECDIS and extensive Pilot Training and assessment.

Pilots come to the College from all over the globe and it has been involved in some extremely high-profile training programmes.

When the King of Morocco wanted to divert commercial shipping traffic out of the Port of Tangier in order to develop tourism, South Tyneside College was instrumental in Pilot and VTS Training for the new Tangier-Med Port.

Even before the new port was built, South Tyneside College created a simulation based on construction plans and began training Pilots for the Port Authority. This meant that the Pilots were fully prepared when the port became operational.

Thanks to extensive ongoing investment, South Tyneside College's marine and nautical training facilities are amongst the best in the world.

The College's Marine Simulation, Ports and Harbour's Department features six simulated navigational bridges – including two full mission bridges - a full mission engine simulator, two VTS Simulation Suites and a Radar Station featuring a navigational aids laboratory and four bridge Transas Navi-Pro Simulator. There is also a four bridge Polaris desk-top simulator, which is mainly used for ECDIS training and the bridge watchkeeping module of the NARAS (Ops) course.

The department has played an important role within the local marine community.

When the offshore oil production vessel, FPSO Bonga, came to the River Tyne to have topside processing modules installed over the course of a year, South Tyneside College was instrumental in ensuring that the vessel navigated the River safely and successfully.

Chris Thompson, Head of the Marine Simulation Unit at South Tyneside College, said: 'At 300,000 tons and 305 metres long, the Bonga was by far the largest vessel ever to enter the Tyne. We knew that bringing it in was going to be a major operation, so the navigation planning process started months before the actual ship arrived.

'Our first task was to improve an existing computer generated visual simulation of the River Tyne and create a virtual model of the Bonga. This then enabled us to run simulated exercises for Bonga in a variety of weather and tidal conditions.

'Navigating any river relies strongly on the local pilots' knowledge of the waters so, in order to plan the simulation exercises, we worked very closely with the Tyne Pilots and Tyne Harbour Master.

'Once the simulation was set up, we worked up a number of scenarios to determine the parameters for the safe passage of Bonga. As well as assessing its handling in a variety of weather conditions, we looked at the number of tugs necessary and where the towing points for these tugs should be.

'With the knowledge and experience of Tyne Pilots to assist in running these simulations, we were able to ensure that the actual event went extremely smoothly and the

Bonga navigated the Tyne without incident.'

At South Tyneside College, students learn about traditional navigation methods as well as cutting edge navigation technology. However industry and associated training trends have changed over the last few years and on some courses the focus is now much more on people skills than on the technology.

Senior lecturer John Hewett points out: 'You can have the most advanced technology in the world but if you have people operating it, who aren't working together well as a team or aren't communicating effectively, then potentially mistakes are going to be made.

'Many of the key marine employers recognise the importance of this issue and we deliver dozens of courses every year aimed at improving the effectiveness of ship's teams.'

Maersk is a good example of this.

The Maersk Company has been working closely with South Tyneside College since it opened its Newcastle training centre in February 2007. Maersk instructors work alongside South Tyneside College personnel to deliver courses in crew resource management training and ship handling skills to a selection of Maersk's 2,500 staff.

Now Maersk has booked 40 weeks of training throughout 2008 with South Tyneside College to upskill around 400 of its staff. This valuable contract means that the College's new bridge simulator is almost fully booked for the whole of this year. Richard Booth, General Manager of Maersk Training Centre in Newcastle, said: 'The College is one of only two in the UK that can offer a connection between the engine room simulator and the bridge simulator, enabling us to carry out real-life ship operational scenarios as training exercises.

'It is these facilities and the quality of teaching and support on offer which have helped to secure our deal with the College to deliver this year's training needs.'

South Tyneside College is now looking to target new markets, which can benefit from its expertise. In another global first, the College is investing in new software, developed by Kongsberg, which will allow a connection between the engine room simulator and the bridge simulator using a cruise vessel as the simulated model.

This will enable engineers and bridge staff from cruise ships to be trained together in realistic exercises so that they can experience the results of their actions in a safe environment.

As well as offering tangible financial benefits from insurance savings, the integrated courses can vastly improve communication and understanding between the bridge and engine room and allow ship personnel to operate more effectively as one team.

Chris Thompson said: 'This new software will revolutionise operational training for the cruise industry. Although training programmes already exist for bridge and engine room cruise vessels separately, there really is no substitute for training exercises which simulate a real-life situation in real-time with the entire ship's staff working together.

'This training will ensure that engine room and bridge personnel from cruise vessels learn to function more effectively as a cohesive team and gain a much greater understanding of the challenges and demands of each other's working areas.

'Hopefully this will have a tangible financial impact for the sector, as well as reducing the number of accidents and incidents at sea.'

The integrated ship simulation training should be available for the cruise industry from May 2008.

To find out more about South Tyneside College and the wide range of courses it offers, please contact the information centre on (0191) 427 3900, or log on to www.stc.ac.uk.

Groups and Branches

Croatian Branch

The Croatian Branch is hosting the 1st GNSS Vulnerabilities and Solutions Conference as Baska, Krk Island, Croatia between 7-9 September 2008. Global Navigation Satellite Systems (GNSS), such as the successful Global Positioning System (GPS) and the proposed European Galileo, are here to stay. GNSS have applications across a diverse range of technological, commercial and environmental sectors and have now come to the attention of the general public.

There is a current and growing reliance on GPS, for instance, within a diverse range of safety critical applications, such as land transportation, marine navigation and civil aviation. Its use has also become embedded in many other aspects of human activity, for example in construction, mining, construction, agriculture, surveying, atmospheric and environmental monitoring. This three day event will focus on problems and vulnerabilities, and in particular developments aiming to improve the accuracy and reliability of GNSS. It is aimed at bringing together academia, industry and the user community in order to disseminate information on GNSS technology and applications, with the aim of raising awareness of recent developments.

By the time this issue of *Navigation News* is published, all potential speakers and presenters will have submitted their extended abstracts. Final decisions regarding the acceptance of papers will be reached by 1 June, when the authors of accepted abstracts will be notified and asked to submit their papers (up to 10 pages recommended) by 1 July, 2008.

Renato Filjar

Scottish Branch

The February meeting of the Scottish Branch saw members in Greenock on the Clyde, visiting the new Northern Lighthouse Board Tender Pharos, latest in a line of that name and launched last year. Pharos' work involves servicing and repair of buoys and storing and maintenance of lighthouses around the coast of Scotland and the Isle of Man, as well as occasional work for Trinity House in England and Wales. In addition she undertakes commercial work for harbour authorities and the North Sea oil industry.

Pharos has all the latest navigation and communication aids, in particular Dynamic Positioning which enables the ship to be held stationary on a precise GPS position whilst the large aft-deck crane is used to position buoys. The bridge is very large, allowing control of the ship from multiple positions. There is a helipad on the bows and space for

lifting heavy items by helicopter on the stern. The top half of a north cardinal buoy sat there waiting, the latest type with solar panels on all four sides and LED light at the top.

Aside from our group's principal interest in the bridge and the navigation possibilities, the rest of the ship had much of interest. The crew of 18 is comfortably accommodated in identical single cabins with further supernumerary cabins for visitors, especially for when the Patron Princess Anne and the Commissioners go on inspection visits. Every need is catered for, from electrical and joinery workshops to changing and laundry space for dirty working gear. Catering is clearly to a high standard, but offset by a small gym, included at the request of the crew. The engine room and propulsion systems were particularly impressive and the engineers in the group lingered long amid threats of transportation to Oban. Everywhere the emphasis in the design and operation of the ship is on safety, and especially fire safety.

Barbara Wright

Solent Branch

With violent storm force 12 at the Needles and a damaged tanker being towed to Fawley as I write these notes, the weather is currently dominating the news in the Solent area. The good news is that thanks to the world wide web, one can be kept up-to-date without being wind-swept or wet. As well as all the normal sources of weather information, there are a number of local web sites that are well worth a mention.

www.ais-live.co.uk provides lots of news and is particularly interesting, because it includes the current AIS plot of ships in the Solent and the Channel - name, course and speed, call sign etc. It also shows the ship's destination, but this is only accurate if the Master keeps it up-dated.

If you want to find out the actual wind force and direction before setting off, www.sotonmet.co.uk provides this for a number of locations including the Bramble Bank.

The Queen's Harbour Master, Portsmouth, runs a most useful site providing a range of information for both local and visiting vessels, including tidal data. It also has a variety of links to other sites. You can also register with him to receive local notices by e-mail. www.qhmportsmouth.com

To learn about Solent sailing events, yacht clubs, classes and much more for the recreational sailor, the site to visit is www.scra.co.uk

The above comments lead neatly to the RIN's own website – www.rin.org.uk, on which the Solent Branch has its own section. We receive a steady stream of invitations from other organisations to join in their events. Some of these are at quite short notice and apart from e-mail; the only economic way of passing these on is by the website. The website also includes a 'forum' section; please use this, among other things, to suggest ideas for the next season's programme.

Thanks to our own activities and invitations, the period mid January to mid-

March have been particularly busy with eight events, covering topics as varied as 'The History of K-class submarines' through to 'How Marine Animals Navigate.' There will be more about the latter in the next issue of *Navigation News*.

Visits are always popular. It was clear from a recent visit to the RN Marine Engineering Training school, HMS Sultan, that the standards being set and achieved are as high as they ever were. The RN has had to adapt to meet the aspirations of modern youth, but it has succeeded in doing so while still maintaining a military ethos. It was encouraging to see the emphasis being placed on hands-on training and limited use of classrooms. Written examinations have been largely replaced by practical tests.

A regular feature of the Solent Branch's winter programme is our annual visit to Ordnance Survey. This year, Richard Peckham, of EADS Astrium and UKSpace, gave us a fascinating insight into the technology, future and, not least, the politics of Galileo. This event was introduced by our President, Professor David Last. It was David's final visit as President to the Solent Branch before he hands over the role at this year's AGM. David and his wife Jean have been great supporters of the Solent Branch. We are most grateful to them and wish them every happiness in the future.

Looking to the future, our final local meeting of the season will be at the Warsash Maritime Academy on 17th April at which Dr Chaz Dixon, also of EADS Astrium, will describe the latest trials they have been carry out off Oban on Pseudolites. Charles assures us that these little chaps may look and sound like Daleks, but their role will be to help navigators and not to 'EXTERMINATE!' Do not let the title of this talk put you off; it will be most interesting presentation – not least because Charles will tell us about how they had to survive on malt whisky when the water ran out!

Mike Highwood

Animal Navigation Group

By the time this issue of *Navigation News* is circulated, some of you will be reading it at our RIN 08 Conference at the University of Reading (see the feature on page XX).

There are only minor changes to the Conference Programme that was enclosed with the last issue of Navigation News.

Registrations are still being received at the time of writing this report, but it is already certain that attendance will be greater than the 100 or so which was the best achieved at previous animal navigation conferences.

A feature of RIN 08 will be the attendance of Brett Westwood and colleagues from the BBC Natural History Unit. They will be collecting material and conducting interviews for the BBC4 radio series, 'World on the Move.' This comprises some 40 programmes broadcast at 11.00 on Tuesday mornings, also available on the BBC website (www.bbc.co.uk/BBC4/worldonthemove)

Sponsorship for the Conference has kindly been provided by the Company of Biologists, DSTL, the US Navy and possibly also by the US Air Force. These contributions are much appreciated and are used to keep registration fees as low as possible while ensuring that the RIN does not make a loss, and to assist with accommodation costs for post-graduate students.

The Spring issue of the ANG Newsletter was distributed in March (and is available on the RIN website). It contains nearly 70 abstracts of papers on topics which include not only the usual suspects such as turtles, migratory birds, bees, and pigeons and fish, but also creatures less studied in their navigational abilities such as pit vipers, crocodiles, penguins, cockroaches and domestic dogs. The Newsletter was compiled, as always, by Pinky Grocott and edited by Theresa Burt de Perera. Their efforts in producing this 23 page document, packed with information, are much appreciated.

After many problems associated with the reconstituted RIN website, Pinky Grocott has re-established his Animal Forum, which stands at 350 members in 34 countries. His Bibliography on the members side of the RIN website continues to grow. It currently stands at over 10,000 references and lists over 7000 research papers.

In the next issue of *Navigation News*, we look forward to being able to report on yet another successful conference in our Animal Navigation series.

John Kemp

GANG

I am writing this news on my way back from a highly successful visit by the GANG presentation team to the RIN's Scottish Branch at the Two Bridges Hotel, South Queensferry. The long-term weather forecast for the evening was foul – very strong winds and heavy snow showers. However, while the wind did blow there was no snow and the Branch royally entertained us. The presentation room was full with an excellent audience who were very interested and responsive with questions on the day's subject – 'The Uses and Abuses of GPS by GA.' One more such presentation is planned for the spring to the East Staffordshire Aviation Group in Burton on Trent on 24th April. In you live in the area, we would be delighted to see you at this event, details can be obtained from RIN HQ.

It is with great regret that I must tell you that Arthur Creighton has decided to leave the GANG to pursue other interests. We all owe him a deep debt of gratitude for the work that he has done over the past nine years. He has contributed to the GANG Committee, helping in many ways, from making presentations to providing visual material for show stands and for a short time he was the Chairman until he took over the task of running TopNav from Gordon Wansbrough-White. For the last eight years Arthur has meticulously planned the TopNav routes, improved the paperwork and briefings and last year introduced trackers into the competition, together with an updated marking regime. The popular and vibrant TopNav competition, which Arthur has left behind, does great credit to the Institute. All GANG members wish Arthur well for the future and are delighted to hear that he will be remaining on Council and continuing to take an active interest in the M&F Committee.

David Cockburn has volunteered to undertake the planning and organisation of the flying side of the TopNav competition, while I will mange the administrative side. The White Waltham competition will take place this year on Saturday 12th July and we still hope to stage a TopNav North on Saturday 24th May at an airfield in Yorkshire. As soon as the venue is confirmed we will send GANG members details of the event.

It has been noted by some that most of the GANG's activities centre on the PPL holder who flies VFR in the UK and mainly in the southeast of England. Indeed the VFR pilot group is the largest GA grouping by far and most activity does take place in the South East so it could be said that GANG caters for the masses. However, over the past year or so we have tried to take GANG and its activities further a field as indicated in previous editions of Navigation News. In the coming year, GANG would like to spread its range of activity still further and engage in the problems faced by the amateur GA pilot who flies IFR. However, to achieve this we do need positive contributions from IFR qualified pilots, so if you are interested then please let me know and join the GANG.

John Gentleman

HANG

The first HANG talk which will be held at 1430 on 9 Apr 08 at Shoreham Airport. This will be close to the *Navigation News* publication date but advance notice has already been given to HANG members. The first talk will be by our ex-Chairman Brian Kendall on 'The Prelude to Radar.' This will deal with the Sound Mirror System of the 1920s and early 30s and then the various elements that eventually led to its replacement by the first radar, the Daventry Experiment and finally a brief description of CH radar.

The second talk will be by the present

Chairman, Keith Hope-Lang, on 'Mosquito PR Operations in the Med.' It is closely based on the experiences of a friend who flew as camera operator in Mosquitos.

The meeting will continue the idea of an artefacts table. Most of us must have many miscellaneous objects at home, so we are encouraged to bring two or three along for other members to see.

The meeting will be held in the terminal building at Shoreham Airport, which is like a time warp – so much so that it regularly features in period films and shows such as the *Poirot* series. There is a café with a full range of snacks and meals and a fine view of the airfield.

The second summer meeting will be held at the other traditional location of Tangmere Air Museum. HANG has used Tangmere and Shoreham for many years now. The meeting is planned in the usual format for Wednesday 16 July. More details will follow in future issues of *Navigation News*.

Keith Hope-Lang

LN&LG

On 26 February 2008, Graeme Griffiths and Nigel Wall of the LN&LG flew over to join the Croatian Branch at the University of Zagreb, to give presentations on road toll charging, including GNSS and its advantages and disadvantages. Renato Filjar, Chair of the Croatian Branch, announced that he had organised a press conference, breakfast television interview, and an audience of around 200 for the event, comprising students, officials from local and national government and other dignitaries.

We were met in Croatia by Renato and his team - Kreshimir Vidovic and Marco Sevrovic from the Institute of Navigation based within the University Transport Faculty. For dinner, we were joined by four professors from the University who gave us a picture of what we were getting into, the feel of what they were trying to achieve, and how we could help them achieve their goals.

By the morning we had modified the dialog of our presentations to be of more focused assistance to them.

The Dean, Professor Ivan Bosnjac, opened the workshop, followed by Renato, then my presentation about the RIN. Getting to the meat of the matter, Nigel gave the assembled crowd the benefit of his knowledge of the English road toll charging schemes being assessed in the UK, and I followed with a presentation on the vulnerability of GNSS. Finally, Nigel gave a presentation on 'Planning for the Future,' with ideas on collaboration in R&D. Kreshimir and Marco rounded off the event with their presentations on 'Conflicts of Vehicle Flows in Traffic Networks,' and 'The Disadvantages of Current Croatian Road Charging Policy and Improvements.' Over an excellent buffet lunch, we had a chance to meet some of the officials and students and to answer many queries.

The following morning we were taken to the University and given an insight into the research the transport faculty was doing to improve congestion and how they had gathered the data.

Later we were taken to the University airfield for what we thought was going to be an aerial survey of the road system. I had casually mentioned to the professors that I was training for my private pilots licence over Tuesday night's dinner, but I was still taken by complete surprise when Goran Kovacic the pilot invited me to fly the Cessna 172N under his supervision. Nigel sat in the back taking photographs of Zagreb City from 2000ft.

Following a thoroughly successful inaugural trip, more co-operation and visits are in the pipeline for the future. A very special thank you to Renato for making this first visit such a memorable one.

Graeme Griffiths

SNUG/SSIG

The Technical Committee recently agreed to the renaming and refocusing of the Satellite Navigation User Group to become the Space Special Interest Group. The rationale behind this change is that the original purpose of the SNUG to consider the needs of GNSS users has moved to be firmly in the hands of the Land, Sea and Air SIGS. You may indeed have noticed that the link on the Institute's web site has already been renamed.

However some issues do not have an obvious home in one of these SIGs and hence the RIN feels that a Space SIG is the right place to consider issues such as Galileo and the other up and coming (or re-coming) global navigation satellite systems.

Following the recent Galileo: To Be or Not To Be seminar at the RGS, a number of people came forward to consider how these issues can best be addressed by the RIN. Initially ideas will be exchanged by email and hopefully a small driving committee will be formed. If you would like to be part of this e-committee, then please let either myself (tonyscorer@yahoo.com) or the Director (director@rin.org.uk) know.

Tony Scorer

Space Weather

In our last report we noted that 2008 heralded the start of a new solar cycle. The first two months of the newly christened cycle 24 have not been uneventful. We have had several periods of mild geomagnetic activity: 5-8 January, 14-19 January, 1-3 February, 10-15 February, 18-19 February and 27 February - 1 March. This last period was the most significant with activity levels reaching a storm classification globally.

For those interested in viewing the aurora in the UK chances unfortunately remain slim. All activity during this time was mild, only providing entertaining light shows for those in the auroral regions around Alaska, Canada and Scandinavia. The best viewpoint however is from space, as the crew of the International Space Station discovered during the event on the 1 February.

All these periods of geomagnetic activity were caused by coronal holes on the sun. These are vast regions where the sun's magnetic field is directed outwards allowing the solar wind to escape. In general the solar wind - a constant stream of charged particles emanating from the sun - travels at around 400 km per second towards the Earth. In a coronal hole this wind can accelerate to around twice that speed. This fast solar wind stream can buffet the Earth's magnetic field giving rise to the mild geomagnetic activity we have seen for the past few months.

Sarah Reay
National Geomagnetic Service
British Geological Survey
www.geomag.bgs.ac.uk

WHAT'S ON

The following meetings and lectures are open to all members of the Institute and their colleagues. Most are non-fee paying, with the exception of those marked with an asterisk (*). Most events can now be booked through the website *www.rin.org.uk*

***23-25 April**
Pierre Baudis Convention Center
11, Esplanade Compans Caffarelli,
Toulouse, France
ENC-GNSS 2008 – The European Navigation Conference
The ENC-GNSS conference is a unique opportunity to meet all the key actors in the navigation area and to be informed on the latest development in navigation and positioning systems, techniques and their applications. High-level scientific activities will be highlighted during the conference. The performances of the GNSS systems, their space and ground segments and the user equipments are steadily improving to fulfil the need for information on location everywhere, including out-door and in-door areas. Associated with mobile communication terminals, the new navigation systems offer the opportunity to design an infinite number of new services. For more information, visit www.toulousespaceshow.eu/enc-gnss08/index.htm

***10-12 June**
Canary Islands Fruit Terminal,
ABP Southampton
Seawork 2008
Seawork International is the biggest and fastest growing business to business event for the commercial marine and workboat sectors in Europe, attracting more than 6000 high calibre visitors from 40 countries across the globe. It is a one-stop forum where buyers, sellers, innovators and legislators come together for three invaluable days at one incomparable location. RIN will be having a stand at Seawork – come along and support us.

***13-15 June**
Wycombe Air Park
AeroExpo London 2008
This event will showcase all sections of the market, including the latest aircraft available - from light aircraft, or pistons and turboprops from all the major manufacturers, to Gliders and Power Gliders; AeroExpo has them covered. RIN will be having a stand at AeoExpo – come along and support us.

18 June
Imperial College London
New Navigators Day
The RIN's annual seminar allowing the best students in navigation research and development to show their work to an audience of peers, tutors and industry players. Contact Kathy Hossain on 020 7591 3135 for more details.

***9 July**
Royal Geographical Society,
1 Kensington Gore, London
RIN AGM
While the AGM itself is free, the reception will be payable. NB – The date of this event has been changed to accommodate exciting developments in the day's programme. Make sure you have it in your diary, and watch www.rin.org.uk for details.

Boscombe Down Branch

10 April at 1815
Lecture Hall Building 452,
Boscombe Down
Helicopters Then And Now
Explore the history of helicopter development and the capabilities of today's modern machines with Air Marshall Colville.

15 May at 1815
Lecture Hall Building 452,
Boscombe Down
Satellite Navigation: Truths And Myths
RIN President Professor David Last explores the truths behind successful GNSS.

19 June at 1815
Lecture Hall Building 452,
Boscombe Down
The GIOVE-A Mission
The GIOVE-A mission, precursor to Galileo, is explained by Dr Stuart Eves of Surrey Sattelite Technology Ltd.

Solent Branch

17 April at 1930
Warsash Maritime Academy, Southampton
Future Harbour Ops Guided By Pseudolites
A talk by Dr Charles Dixon FRIN. A joint meeting of the Solent Branch and the Nautical Institute, hosted by the Solent Branch. Prior booking is not required, and guests will be welcome.

23rd April 2008 - 1830 for 1845
Southampton Solent University,
Sir James Matthews Building, Above Bar Street, Soton SO14 7DW
Griffon Hovercraft
Mathew Gibson of Griffon Hovercraft will describe the variety of uses to which hovercraft are being put through out the world and the great success they are having. This meeting is being run by the Chartered Institute of Logistics. RIN members are invited, prior booking is not required and there is no charge.

GANG

24 April
Albion Hotel, Shobnall Road, Burton on Trent DE14 2BE
The Use And Abuse of GPS in GA
A joint East Staffs Flying Club/RIN event. Mark Batin, David Cockburn and John Gentlemen explore the dos and don'ts of using GPS in General Aviation.
All are welcome and there is no charge. To book your place, contact Hugh Clarke on 01283 531556 or hughclarke61@hotmail.com

21-23 May
Parc Aberporth, Wales
European Students' Competition on Unmanned Aircraft Systems
A number of universities are entering AUVs of less than 20 Kg to perform four feats of flying and navigation – a pylon race, precision flying through a virtual box, spotting objects and a spot landing. RIN President Professor David Last is one of the judges and the RIN is sponsoring a prize of £500 for the best navigation performance. Check the RIN website, www.rin.org.uk for further details.

24 May
Sherburn in Elmett, Yorkshire
TopNav North
Test your navigational skills flying 'blind' from clue to clue in the first ever TopNav North competition. For more details, contact Kathy Hossain on 020 7591 3135 or conference@rin.org.uk.

HANG

9 April
Shoreham Airport
Come and join HANG members at Shoreham Airport for their first meeting of the summer season and don't forget to bring your old relics along! The meeting will open with a talk by Brian Kendall on 'The Prelude to Radar.' This will be followed by Keith Hope-Lang speaking on 'Mosquito PR Operations in the Med.' For more details

Small Craft Group

17 April 2008 at 1500
Royal Thames Yacht Club,
60 Knightsbridge, London SW1
SCG Committee Meeting and AGM. Joint meeting with the Royal Thames Yacht Club
The Small Craft Group committee meeting is at 1500. The AGM will open with drinks at 1800, followed by a talk on at 1845 – Train For Trouble. All Members, Associates and guests are welcome, especially to the talk. There is no charge or need to register. Those wanting supper later (£26 with wine) should book direct with RTYC Reception on 020 7235 2121.