



2006

no. 47

INTERNATIONAL VERSION

ANAE LA LETTRE

Académie Nationale de l'Air et de l'Espace

EVOLUTION OF THE AERONAUTICS INDUSTRY

Editorial



Galileo is coming to Toulouse; China has just put in an order for 150 Airbus aircraft: two very good reasons for the city to be celebrating. The occasional discordant note can be heard though: Isn't setting up an assembly line in China like letting a fox loose in the chicken coop? Isn't there a danger of

Airbus clones flooding the market in a few years time at unbeatable prices? Having said that, no-one seems surprised to see Eurocopter joining forces with a Chinese partner to design and manufacture a new type of helicopter. Anyway, this is all still in discussion stage and, after all, assembly does only represent a small part of the overall value of an aircraft.

There is nothing new to all this of course: military orders have always brought their fair share of industrial compensations, often involving technology transfers; Eurocopter set up assembly lines long ago in China and India in the civilian sector; the interior of the Dassault Falcon is fitted out in the US for its American clientele. This is the sine qua non for breaking into foreign markets and Boeing is no exception, with more than a third of its flagship plane, the 787, currently being built in Japan.

The experience of the automobile industry, in which such practice is commonplace, shows that all sides reap the benefits and that customers do not much mind if their car has been assembled in Romania from a Japanese body and an engine shipped in from Mexico.

It pays to be careful in drawing up contracts though. Sud Aviation and Moran Saulnier came to regret bitterly that they had not taken more precautions with their American partners.

In all commercial aviation sectors today, freed up markets have forced small players out of the ring to leave only two sparring partners: ATR and Bombardier for turboprops, Embraer and Canadair for general aviation jet aircraft, and Airbus and Boeing for larger planes. Any weakness, however slight, on the part of one of the protagonists in each category will lead to the other gaining dominant position, a paradoxical outcome of triumphal free-marketeering. The idea that an economic giant such as China, capable of launching human beings into space and with immense transportation needs, would agree to remain on the touchline of the civil aviation industry is simply puerile. The choice of partner would therefore seem to be a sound one, especially considering that Europe, leaving aside customary British reserves, has managed to bury its national rivalries in order to produce excellence in the shape of Airbus and Eurocopter.

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The world is gradually waking up to the fact that the era of cheap crude oil is drawing to a close. Energy saving is being placed higher and higher on the agenda along with renewable energies, even though we know that they have only limited possibilities. Air transport, using kerosene, a fuel which is even rarer than crude oil, is in the front line given the importance of fuel costs in its balance sheet. The Academy has decided to hold an international colloquium in late 2006 to tackle energy issues facing air transport.

The consequences of rising oil prices are already being felt in the area of sea transportation - in which the shipping of cereals has been revolutionised in order to cut down on transport costs - and in regional air transport - where the bi-turboprop, consuming less fuel than the jet aircraft, is making a comeback. This is the subject of this month's main article by Jean-Paul Perrais.

Jean-Claude Bück
ANAE President

Contents

Editorial	p 1
Return of the Turboprop	p 2-3
Plenary session: some photos	p 4
Life of the Academy	p 5
For your diary	p 6

RETURN OF THE TURBOPROP

Jean-Paul PERRAIS

Former Director for Regional Air Transport Programmes at Aerospatiale, ANAE Treasurer



Since air transport deregulation in the United States in 1978 and the progressive free market policies pursued in Europe from the 1980s on, regional air transport¹ has continued its growth in these two main regions of the world and has started to expand in Asia (particularly India and East Asia).

Until the early 1990s, the planes used were mainly “turboprops”, propeller aircraft driven by jet prop engines. Only the largest (80 to 100 places) were jet aircraft.

In 1992, smaller jet aircraft put in an appearance: Canadair’s 50-seater CRJ 200, followed by the 70-seater CRJ 700 version, the ERJ 145 with 45/50 seats and ERJ 135 stripped to 35/37 seats. These smaller jets took only a few years to unseat the turboprops: their higher speed reduced travel time over longer stages which meant that airlines could offer a greater number of flights per day. Regional carriers were also able to open up longer, but less busy routes, which had not been profitable enough with bigger planes. Passengers began to look on propeller aircraft as being unfashionable, uncomfortable and even less safe. Only short stages and freight traffic (second hand passenger aircraft converted into cargo planes) seemed likely to carry on using propellers.

This marginalising of turboprops appeared inevitable. SAAB, Fokker, British Aerospace, Dornier and CASA in Spain had withdrawn from the market, leaving only two main manufacturers: Bombardier – which took up

the de Havilland heritage with the Dash 8-100/200/300 (45/50 seats) and the more rapid Dash 8-400 (70/74 seats) – and ATR with the ATR 42-500 (48/50 seats) and ATR 72-500 (68/72 seats). Sales were plummeting; in 2003, Bombardier considered halting production of its Dash 8 and ATR was struggling.



Fig. 1: An ATR 72-500 on a demonstration flight above the clouds

But in the first few months of 2004, the price of fuel soared². This was the main factor behind the decision of regional airlines to revue their aircraft procurement policies.

In the United States the “majors” were already in financial straits because of the price war, exacerbated by the competition coming from low-cost carriers. US Airways, United, Delta and Northwest filed for “Chapter 11” of the bankruptcy law. They backtracked on agreements concluded with their subsidiary regional transport companies or associates. But such long-term agreements had ensured the latter a minimum

revenue regardless of the price of fuel and the passenger load factor. In addition, low-fare airlines concentrated their efforts on smaller capacity routes³. In order to compete in this slot, the major airlines began to require their regional networks to operate larger capacity aircraft (jet aircraft of course). These two elements have, since mid 2004, led to a steep drop in orders for smaller jets (less than 70 seats), which were too small to compete with the low-cost airlines and too expensive⁴ to operate for regional carriers which had lost their “protection” against the price of kerosene. All this prompted a renewed interest in turboprops⁵.

In Europe, where there are fewer smaller jets than turboprops, regional carriers are beginning to feel the direct effects of competition from low-price airlines. As a result, they are being forced to cut back still further on operating costs of their generally mixed (small jets and turboprops) fleets. Aircraft that are cost-efficient in fuel terms are therefore much more appealing.

Regional transport is also developing fast in Asia. There very few small jets here and new regional airlines are being created on the model of the American (Southwest) or European (Ryanair) low-cost carriers. Since their labour costs are low, it is seen as even more important to cut fuel costs. In India for instance, where domestic transport is rapidly growing, turboprops are highly successful⁶.

Other factors working against small jets include environmental constraints. Trials have shown that a propeller aircraft gives off 3,000 to 5,000 tonnes less CO₂ per year than a small jet of similar capacity. The decision taken by the European Union that by 2008, airlines from member states must

1. The term “regional transport” covers short trips carried out by planes seating less than 80 to 100 passengers.

2. From a world average of \$0.8 US per gallon in 2003, the price leapt to 1\$ per gallon in the first half of 2004, 1.27 for the second half and 1.52 for the first half of 2005.

3. The best example is that of JetBlue which ordered 100 ERJ 190s (98/100 seaters) from Embraer in 2003.

4. With the US gallon of kerosene at \$1.2, a fleet of 10 turboprops operating on stages of 300 NM enables a saving of 4.4 million dollars per year in relation to 10 similar capacity small jets (in other words more than a quarter of the average price of a turboprop).

5. Horizon ordered 12 Dash 8-400s in 2004, eight of which were initially orders for CRJ 700s.

6. In November 2005 Kingfisher Airlines put in 20 firm orders for ATR 72-500s plus 15 options.

conform to the Kyoto protocol (with the possibility of buying derogations within



Fig. 2: Dash 8-100 on snowy airstrip in Scandinavia

certain limits) is also damaging to jet aircraft, especially those seating less than 80. On top of this, the price of this “right to pollute” can only increase as the prospect of global warming becomes ever more real and uneasiness as regards climate change grows.

These economic factors gave rise to a spectacular rise in orders for turboprops in late 2004. In 2005, in the 30-90 seater range, orders for propeller aircraft significantly outnumbered smaller jets⁷. ATR and Bombardier, for the DHC-8 family, are due to step up their production rate, whilst Bombardier’s CRJ production lines and Embraer’s ERJ ones are lagging behind and even closing down on the smallest models of their ranges.

Are we witnessing a momentary lift in the fortunes of propeller aircraft, or a lasting comeback?

The soaring price of crude had apparently been reversed by the end of 2005⁸. In the short term, it could carry on falling (if Chinese demand slows down and American growth drops off) but both medium and long-term forecasts predict that oil will be rare and expensive. The singular nature of their product (SKOs – seat/kilometres offered are non stockable) and the steep compe-

titition that reigns in their sector generally forces air carriers to favour short-term strategies, but in this case they cannot ignore the prognosis of expensive fuel. This is the first reason why regional carriers are continuing to include turboprops in their future fleet planning.

The second reason consists of increased pressure to preserve an acceptable environment for life on earth, by limiting production of greenhouse gases. Many of our society’s energy requirements will be met by substitute solutions but it is difficult to find a serious alternative to kerosene for aircraft propulsion. This will lead to even more pressure being exerted on air transport, which will be forced into consuming less fuel if it wishes to survive against ground and sea transport, especially over short distances.

Until recently, the image of propeller aircraft had suffered as compared to smaller jets since the latter were reputed to have quieter cabins, to climb more quickly, to spend less time in turbulent atmospheric layers or icy clouds, and to arrive at their destination sooner.

But recent polls have shown that this image is improving, and the following factors have emerged:

- the difference in travel time between jets and turboprops on trips of under 500 km (in other words most regional routes) lies within the average delays noted in short-haul air transport;
- in terms of noise and vibrations, ATRs and Dash-8s operating since the mid 1990 are as comfortable for passengers as small jets because the latter have less suitable fuselage sections (the CRJ is derived from a

business plane, the ERJ 135/145, which has three passengers in the front);

- 20-seater or more turboprops are as safe as jet aircraft and certified according to the same regulations. Safety devices for flight in freezing conditions have been extended well beyond regulatory demands and crews have been well prepared to cope with any eventuality.

The turboprop’s comeback would thus seem to be confirmed.

Of course, manufacturers will have to pursue their efforts to reduce operation costs by further simplifying maintenance operations and flying procedures. Many regional operators have less sophisticated maintenance services than bigger airlines and personnel rotas are more demanding. Pilots often start their career in such airlines and manufacturers will therefore have to continue to play a major role in crew training and qualification.

Systems and equipment will also need to be progressively modernised and airframes will have to have a longer life, although their overall design is suited to efficient operation.

Finally the “light cargo” market offers good prospects for converting passenger aircraft, whose residual values remain high, thus facilitating the financing of competitive sales.

As is the case for the large aircraft market – shared between Airbus and Boeing – only two manufacturers, Bombardier and Embraer, are still in the running for smaller jets⁹ and two, Bombardier and ATR, for turboprops. These businesses have a long experience of the regional market and are present in most countries of the world.

European manufacturers, after many ups and downs, are still very present on the regional market, thanks to the ATR programme. They have become much more aware of the specific needs of regional carriers. This repossession of the market by turboprops proves that it pays to persevere; it is now time to build on this success.

7. By mid December, 146 net orders for turboprops had been placed since the beginning of the year, as against 109 orders for small jets (<90 seats); the figures should also be adjusted to include 40 cancellations of small jets.

8. The barrel of crude oil, having topped \$65 in August 2005, then dropped back to \$55.

9. It is too early to predict the chances for success of the new arrivals on the regional small jet market such as the Chinese ARJ 21 (family of aircraft of 80 to 100 seaters, due to be put into service in 2009) and the Russian Sukhoi RRJ (family of 60 to 98 seaters, in service in 2008). These two manufacturers have no experience of the international market for commercial aircraft.

PLENARY SESSION

The Academy's annual plenary session in November provides the occasion to welcome its new members, swear in the Board of Directors and pay tribute to figures who have made some remarkable contribution to the realms of Air and Space.

Here is a photographic account of some of the afternoon's memorable moments.

Traditionally, this session is held in the impressive Salle des Illustres in the Toulouse Town Hall.



Below:

Jacques Lordon et Stéphane Mayer, who received a Silver medal on behalf of EADS SOCATA for the success of the **TBM 700** programme; the 300th aircraft was delivered in July 2004.

From left to right, *the new Board of Directors of the Academy:*

Secretary general **Claude Bechet**, former Air France Captain; treasurer **Jean-Paul Perrais**, former Director for Regional Aviation Programmes at Aerospatiale; Vice-Presidents **Pierre Sparaco**, former Head of the European Office of Aviation Week & Space Technology, **Georges Ville**, former Director for Economic and Financial Strategy at Aerospatiale and **Gérard Brachet**, former Director general of the French Space Agency CNES; and President **Jean-Claude Bück**, former Air France Captain.



Below:

Michel Valdiguie, Deputy Mayor of Toulouse



Opposite and below:

Two Academy members, **Jacques Villain** and **Patrick Facon**, who chose to highlight different facets of the work of Jules Verne in two lectures entitled:

Jules Verne and the conquest of space

and

Jules Verne and aeronautics, commitment and reflection



Left to right:

Jean-Maxime Massimi, representing **Pierre-Albert Vidal**, who was awarded the Vermeil medal for the landmark **NH90 programme of electric flight controls**. These are the first transport helicopters to be equipped with fly-by-wire controls with no mechanical back-up.

Sven Grahn, silver medalist, for his part in the **Smart 1** programme, the first European lunar probe, which was sent into orbit in November 2004.

Marie-Anne Clair, silver medalist, for her lifework at the French Space Agency CNES, particularly as **team leader for the spectrometer on ESA's Gamma-Ray Observatory INTEGRAL**.



Jean-Claude Bück, ANAE President, with **Robert Imbert** and **Jean Zieger**.

The Great Prize was awarded to the **Huygens programme**, and specifically to Directors **Roger Imbert** and **Jean Zieger** who were in charge of the Alcatel Space Cannes industrial establishment during the development phase of the re-entry capsule.

The Academy wished to draw attention to the essential role played by the industrial teams which contributed to the success of the Huygens probe, improving our knowledge on the atmosphere and ground of Titan.



In late 2005, the Academy's activities were particularly intense due to the organisation of the plenary session, the finalising of two reports commissioned by the Community of Agglomeration of Greater Toulouse and the preparation of two colloquia in Toulouse and Aix-en-Provence.

Claude Bechet
General Secretary ANAE
Former Air France Captain

Community of Agglomeration of Greater Toulouse

Within the framework of an agreement entered into with the Community of Agglomeration of Greater Toulouse, the Academy has drawn up reports on certain topical subjects:

- **A Note on GMES: its interest for Greater Toulouse** was drawn up, taking into account the situation before the ESA Council meeting at ministerial level on 5 and 6 December in Berlin. Two reports from the Academy's space committee

concerning GMES were annexed to this report.

- **A Study on the European Aviation Safety Agency EASA** was prepared by compiling different information gathered by academy members, particularly during meetings or colloquia to which EASA members had been invited; it examines EASA's installation in Cologne, its current and future missions and problems it needs to tackle.

Colloquium on Aircraft and ATM Automation

Organised by ANAE and AAAF and sponsored by the European Commission, the Toulouse Municipality, the General Council of Haute-Garonne, the DGAC (French Civil Aviation authority) and Airbus, this colloquium took place on 17 to 19 October in IAS, Toulouse.

Introduced by Jean-Claude Bück, Academy President, and Stuart Matthews, FSF President, and closed by Michel Scheller, AAAF President, the colloquium brought together over thirty prestigious speakers from industry (Boeing and Airbus were both present), from European organisations such as

Eurocontrol and SESAME and from European and American administrations. Assad Kotaité, ICAO President, was kind enough to address participants by a video in order to underline the urgent need for modernisation of the system.

A consensus emerged on the need to use automation in order to face the increase in air traffic, maintain safety and improve economic aspects, whilst recognising the difficulties involved in the transition. More than 200 participants over three days took part in the debate.

Bernard Ziegler
President of the programme committee

Colloquium on Helicopters: Missions and Perspectives

This colloquium, organised by ANAE and sponsored by Eurocopter, Thales and the DGAC, took place on the 8 and 9 November in the Congress Centre in Aix-en-Provence and attracted 120 participants.

After an introduction by Jean-Claude Bück, Academy President, and Gérard David, President of Union Française de l'Hélicoptère, 17 speakers from all sectors took the floor during these two study days.

A gala dinner for 70 persons at Château de Pont Royal at Mallemort provided the

opportunity to celebrate 50 years of Alouette II, the altitude record of 12 400m established by Jean Boulet in 1972, and the landing on Everest, with the video commented by Didier Delsalle himself.

This was the first colloquium of its type to have been organised for some time, **and was invaluable in providing an update on technical, operational and regulatory aspects of helicopter activities.**

Jean-Pierre Dubreuil
President of the programme committee

Hommage to Elisabeth Boselli (1914-2005)

Elisabeth Boselli passed away on 25 November last with her customary discretion.

Born on 11 March 1914 in Paris, she obtained her baccalauréat in 1932 and graduated from the Paris School of Political Sciences in 1935.

Her aeronautical vocation was revealed during a lecture on aviation she attended with her brother. Overwhelmed by the experience, she decided to participate in a joint purchase of a Leopoldof 45 on which she carried out her maiden flight. She went on to obtain her private pilot's licence in 1938.

She subsequently purchased a Zlin 12 and took part in various competitions all round France, winning several prizes; during this period her passion for aviation increased, never to leave her.

The Second World War brought her aeronautic activities to a standstill as she tried unsuccessfully to sign up as a pilot in the French Air Force; it was only in 1944 that she joined the ranks of the first group of 12 female aviators recruited for the French Air Force. Elisabeth Boselli passed the military pilot licence with flying colours and flew on a Dewoitine 520.

This adventure was cut short due to budgetary restrictions evoked at the time of Maryse Hilsz's tragic accident.

Demobilised, Elisabeth passed the public transport licence and turned towards gliding where she excelled, beating an international record when she was aiming at a French one.

In 1953 she rejoined the French Air Force and on 26 January 1955, won the female speed record over 1,000kms at over 746kms per hour. The following month she shattered the world closed circuit distance record on the Mont-de-Marsan - Oran - Mont-de-Marsan route and on 1st March 1955, won the world record for distance over a straight line between Creil and Agadir.

In 1960 she was appointed to the military air traffic head office and retired in 1969.

Elisabeth Boselli, aviation heroine in an era when it was difficult for female pilots to break through, was awarded numerous decorations and distinctions including: Officer of the Légion d'Honneur, Croix de la Valeur Militaire, Médaille de l'aéronautique, Gold Medal from the Aéro-Club de France, Gold Medal of Vieilles Tiges, Medal of the Association des Pilotes de chasse.

She had been correspondent at the Academy since 18 April 1985.

Valérie André
General medical inspector
Former Director of the
2nd Air Region Health Service
Founder member of ANAE

Lecture cycle: D'AIR ET D'ESPACE

Last Tuesday of the month* at 5.30 pm at the Toulouse Médiathèque José Cabanis



This lecture cycle, organised jointly by ANAE and the Toulouse Médiathèque, is now entering its second year.

In the months to come, different speakers, all experts in their fields, will tackle some highly topical themes, for example the evolution of flight safety or

the consequences of the growing use of UAVs.

Subjects considered to be "timeless" have been reprogrammed, for instance the latest developments in the Airbus/Boeing rivalry and an appraisal of the A380 programme just before this superjumbo is due to be put into operational service.

The first lecture in the cycle, by Philippe Jarry, gave the capacity audience a fascinating insight into the future of aviation.

(Please note that talks are given in French).

C A L E N D A R

- Tuesday 31 Jan.: **HOW WILL WE FLY IN THE FUTURE?**
Philippe JARRY, Senior Vice-President Aircraft Strategy, Airbus
- Tuesday 28 Feb.: **BACK TO THE MOON**
Jacques VILLAIN, Director of Space activities, Safran, ANAE member
- Tuesday 28 March: **GALILEO**
Jean-Claude DARDELET, Director of the Galileo concession, and Nicolas de LEDINGHEN, Vice-President Navigation & Integrated Communications, AlcatelAleniaSpace
- Tuesday 25 April: **THE UAV REVOLUTION**
Philippe CAZIN, High Councillor for ONERA, ANAE member
- Tuesday 30 May: **AIRBUS-BOEING: AN ETERNAL DUOPOLY?**
Pierre SPARACO, former Head of the European Office of Aviation Week & Space Technology, ANAE Vice-President
- Tuesday 27 June: **TOULOUSE: AEROSPACE CAPITAL**
Jean-Marc THOMAS, President of Airbus France, ANAE member
- Tuesday 26 Sept.: **HISTORY OF ARIANE**
Philippe COUILLARD, Chief Technical Officer EADS Space, ANAE correspondent
- Tuesday 17* Oct.: **THE A380 BEGINS ACTIVE LIFE**
Patrick TEJEDOR, Project Head for resources and engineering skills, Airbus
- Tuesday 28 Nov.: **FLIGHT SAFETY: "ONE ACCIDENT PER WEEK"?**
Michel GUÉRARD, Vice President product safety communication Airbus

STUDY DAYS ON General aviation

9 and 10 March 2006,
Aéro-Club de France
6 rue Galilée, 75116 Paris

General aviation is going through a difficult period in France which is forcing the aeronautics community to review its future.

The aim of these study days, organised by the Aéro-Club de France, in association with ANAE, AAAF and GIFAS, is to answer the question: "**What are the challenges facing French general aviation in the 21st century within a European context?**"

For further information:
www.anae.fr/comAvLeg/
ou www.aeroclub.com
Aéro-Club de France:
01 47 23 72 72
aeroclub@aeroclub.com

COLLOQUIUM

Air Transport faced with the Energy Challenge

30 Nov. - 1 Dec. 2006 in Toulouse

A progressive decline in global oil production, following a peak around 2010-2030, will result in a growing oil shortage and rising prices in the near future. The development of air transport will be radically affected, not least because for the moment no alternative is available to the use of kerosene produced from oil.

Following on from a study day organised by Fedespace, ANAE decided to hold a colloquium on the subject in order to bring the various players together and put forward some recommendations designed to prepare the future air transportation system to deal with oil shortage and environmental issues.

The colloquium will comprise four sessions:

- Air transportation issues in the 21st century
- Which fuels and aircraft for the mid 21st century?
- Which fuels and aircraft for the late 21st century?
- Which air transportation system for the 21st century?

The *Lettre de l'ANAE* is a two-monthly publication
ISSN 1288-5223

The conclusions and opinions expressed in this document are those of the authors, within a context of freedom of expression cultivated by our Academy. They do not necessarily reflect the opinions of ANAE or its partners.

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PRE-PRESS, TRANSLATION: Lindsey Jones
IMAGE PROCESSING: Arnaud Ribes

PRINTED BY:
ENAC Service Édition
7 avenue Édouard Belin
31055 TOULOUSE Cedex 4

Previous issues:

- no.46 *Low-cost Airlines*, January 2006
- no.45 *Space Committee*, September 2005
- no.44 *Frenchmen of the skies*, June 2005
- no.43 *Transport aircraft and the fuel shortage*, April 2005
- no.42 *Gestation of the A380*, Jan. 2005

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