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Editorial

WELCOME TO THE RUSSIAN AEROSPACE COMMUNITY

On 24 April 2009 in Madrid, at the 9th CEAS Trustees Board Meeting, after a presentation given by Dr Sergey L. Chernyshev, TsAGI, as representing the Russian aerospace community, was unanimously elected as new CEAS Member Society, the eleventh one. Considering the outstanding position of the Russian Federation in aerospace, this event obviously constitutes an important milestone in the progress of our Council.

TsAGI is a transliteration of the Russian abbreviation for "Tsentralniy Aero-Gidrodinamicheskiy Institut", the Central Aerohydrodynamic Institute. It was founded by the famous scientist and pioneer of Russian aviation, Nikolai Yegorovich Zhukovsky, on December 1st, 1918 in Moscow. In 1935 it was relocated to the city of Zhukovsky, Moscow Region.

TsAGI carries out fundamental and applied investigation in several directions: aerodynamics, propulsion, acoustics, strength, hydrodynamics, flight dynamics and measurements. As explained by Dr Chernyshev in his article published in the present bulletin (p. 7), this Institute has for some time been engaged in coordinated activities with European countries, but things are now going further.

In 2004, based on its long-standing experience in aeronautical research co-operation, the Russian Ministry for Education and Science appointed TsAGI as the National Point of Contact for Russia-EU collaboration in aeronautics research. As a matter of fact, TsAGI is involved in many projects of Framework Programmes of the European Union. And this contribution to these programmes is going to increase in the future. On 15-16 October, the 4th Workshop "EU-Russia Co-operation in Aeronautics Research" will be held in Moscow. This Workshop, organised by the European Commission and Ministry for Industry and Trade of the Russian Federation, precisely will aim at enhancing the synergies with European community in aviation science and technology.

Regarding space activities, the co-operation between Europe and Russia is long established since the end of the seventies, steadily evolving into a close partnership in almost all areas of ESA activities: human spaceflights, launchers, science... Presently the ISS programme gives particularly high momentum to the co-operation in human spaceflight: transportation of ESA astronauts to the ISS onboard a Soyuz spacecraft, ATV (Automated Transfer Vehicle) missions, etc. As regards launchers, the Guiana Space Centre is becoming a launch base for the Soyuz launch vehicles: the first launch is expected at the end of 2009.

So, the entry of the Russian aerospace community into our Council is very timely, all the more so as it will participate in the CEAS 2009 Manchester Conference of 26 – 29 October as the latest addition to the list of our distinguished Member Societies. The CEAS management board is determined to provide it with the best possible added values.

Jean-Pierre Sanfourche

Jean-Pierre Sanfourche
Editor-in-Chief,
CEAS Quarterly Bulletin

CEAS

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SPEECH DELIVERED BY PRESIDENT ALLAN COOK AT THE ASD PRESS CONFERENCE, BRUSSELS, JULY 2ND 2009

Allan Cook is President of the ASD and CEO of Cobham.

"Good morning Ladies and Gentlemen and a very warm welcome to the annual ASD press conference, during which I will touch upon important developments that are currently affecting the European aerospace and defence industries which will include our collective view of the current global economic and political situation. I will also address key policy issues and I will present data compiled by ASD on the performance of the European aeronautics, space and defence sectors in 2008, in terms of orders, employment, and turnover.

KEY DEVELOPMENTS AND POLICY ISSUES

Of course our industries in Europe are certainly not immune to the extraordinary economic and political developments that are currently unfolding around the world – the full consequences of which are not yet clear and may not be for some time to come. Our commercial customers have less to spend on our products and services and our governments are under increasing pressure to spend more on social programmes and even less on defence – despite the fact that global terror risks have still not been retired.

For Europe's civil sector the negative effects of the deterioration in the economy are already evident. The global economic slowdown has resulted in a sharp drop in air traffic figures – by the end of this year freight traffic is expected to decrease by 17%, and passenger traffic by 8%. This steep decline in air transport demand is severely denting airline revenue, which are also affected by the recent rise in oil prices (oil has recently climbed back to around $70 a barrel, up $30 since the start of the year).

ASD AeroSpace and Defence Industries Association of Europe

According to the latest IATA estimates, the fall in airline revenue could amount to $80 billion in 2009, which would represent an unprecedented 15% drop compared to 2008. The combined losses of airlines could reach $9 billion in 2009. In parallel the severe tightening of credit conditions has made it increasingly difficult for airlines to finance the purchase of new aircraft. According to most analysts, out of a total of $68bn required to fund this year's delivery of 950 to 1000 Airbus and Boeing aircraft there will be a shortfall of between $10 and $20bn due to the sharp contraction in bank finance.

The environment in which our defence sector operates has also become increasingly complex and challenging. Recent events in North Korea and Iran clearly show that global disorder doesn't belong to the past and that threats to our nations' security are still present. This discrepancy between worrying geopolitical developments on the one hand and European governments' reluctance to invest in defence on the other hand, has become a cause of major concern for us. What is now at stake is our industry's ability to provide Europe with an effective defence capability, as well as with the means to play an important, stabilizing role on the global stage.

In the USA, the current administration already believes that their NATO partners inability – or in some cases their lack of desire – to maintain their investment is a serious threat to the stability of the alliance. There is in fact a very strong case for additional spending on defence. After all, spending less on defence does not make any of the threats we face go away. Many of these threats will require the use of capable well equipped technologically enabled military forces if we are to overcome them. Europe needs military forces that can be more easily deployed than they are at present. Most of Europe's military capabilities are far too fixed and static. To make this transition to greater flexibility and a genuine multi role capability will require investment in new capabilities and equipment.

Against such a bleak and uncertain scenario, one might expect our industry to be in a state of severe depression. This is certainly not the environment that I encountered at the Paris Air Show, a couple of weeks ago. Undoubtedly there was lower attendance but the quality of the attendance and the technology on display gave the show an impressive atmosphere. A number of order announcements were made, with Airbus for instance securing firm orders or letters of intent for more than 100 aircraft – a figure many would have seen as totally unrealistic before the show started, but of course well below the levels of Farnborough last year and Le Bourget in 2007.

We are not out of the woods yet, and the situation is particularly worrying in certain segments. Business aviation orders remain severely depressed, but what is certain is that the mood in Le Bourget was far from gloomy, and this is a great reflection of the confidence with which Europe's aerospace industry looks at its future. Air transport remains a fast growing – but cyclical - sector, which has been doubling in size every fifteen years. The cancellation rate at Airbus stands at only 3% compared with 6% in 2001 and the manufacturing rate for single aisle aircraft is still 50% higher today than in 2002. Our projections suggest that this trend will continue.

SEEKING TO IMPROVE THE NATURE AND EXTENT OF EUROPE'S AEROSPACE AND DEFENCE INDUSTRIES COOPERATION WITH THEIR GLOBAL PARTNERS

What I also find reassuring, in these times of economic hardship, is that Europe's aerospace and defence industries have steered clear of the twin temptations of unilateralism and protectionism, and have actually gone in the opposite direction by seeking to improve the nature and extent of their cooperation with their global partners – in particular those from the U.S.

On June 16th, at the Paris Air Show, ASD Secretary General François Gayet and I, together with Åke Svensson, CEO of Saab, and Pier Francesco Guarguaglini, CEO of Finmeccanica, met with some of our American colleagues, namely Robert Stevens, CEO of Lockheed Martin Corporation, Scott Donnelly, COO of Textron, and Clay Jones, CEO of Rockwell Collins. This high-level CEO dialogue, organised under the aegis of ASD and AIA, the American Aerospace Industries Association, gave us an opportunity to exchange views and learn from each other's experience in dealing with the current economic situation.

We had a fruitful discussion, and found common ground on several key issues. In a joint statement, we called for governments across the Atlantic to avoid the adoption of protectionist policies that would ultimately stifle our industry's competitiveness. We also emphasized that, to preserve a safe and efficient air transportation system, U.S. and EU lawmakers should ensure that current bilateral maintenance agreements continue to be recognized. In particular, we asked for legislation recently proposed in the U.S. House of Representatives to be amended, since the new inspection requirements it imposes contradict the U.S.-EU Bilateral Aviation Safety Agreement (BASA) and could impede its implementation. This is a technical issue, but its implications are very important for our industries across the Atlantic, and it is particularly positive that we approached it in a cooperative way.

• ***Towards the International Forum on Business Ethics Conduct***

Our dialogue with our American colleagues does not stop there. In recent months, areas such as export control, business practice (the combined code of conduct), air traffic management and the environment have all been addressed collectively. I would like to say a few words in particular on EU-US cooperation in the area of ethics, which is crucial for the reputation and social responsibility of our industries. Two years ago the ASD Council, which includes the CEO's of Europe's top 15 aerospace and defence companies, approved the "Common Industry Standards" for European Aerospace and Defence on Ethics and Anti-Corruption. Since then ASD and AIA have worked together on a process which will lead to the creation of the International Forum on Business Ethics Conduct (IFBEC). The IFBEC Working Group, consisting of representatives of the European and US industries, has now drawn up an implementation road map, as well as a list of global Business Ethics Principles.

CONTINUED PROGRESS ON THE ENVIRONMENTAL FRONT: THE CLEAN SKY PROGRAMME

Our industry is not losing sight of its responsibilities towards society at large. And what society expects from us today, more than ever, is continued progress on the environmental front. To travel by air is still one of the greatest freedoms of the 21st century. Our industry with its long history of technical innovation and determination has to be the solution, not the cause of the issue and we do need to do more to develop an industry that is sustainable environmentally and economically.

Through constant technological innovation we have made encouraging progress. For example, fuel consumption levels (and corresponding CO_2 emissions) from a jet aircraft have decreased by over 70% over the last 50 years. However, much more now needs to be done, since the growing popularity and affordability of civil aviation has resulted in an increase in overall CO_2 emissions which is outpacing previous technological improvements.

Our target, as established by ACARE (Advisory Council for Aeronautics Research in Europe), is to reduce CO_2 emissions and noise by 50% of 2000 levels for new aircraft entering into service by 2020. To achieve this ambitious target we are investing €800 million in the "Clean Sky" programme, a seven-year project which aims to fur-

ther reduce the impact of flying on the environment. Clean Sky focuses on 6 sectors: smart fixed-wing aircraft; green regional aircraft; green helicopters; sustainable and green engines; system for green operations; and eco-designs. Among the areas that are being investigated are new propulsion modes such as open-rotor engines that are expected to offer 15% improvements in fuel consumption over today's turbofan engines. 'Clean Sky' will develop and validate breakthrough technologies that will allow Europe to design and build the green aircraft of the future.

Clean Sky is one of the European Union's largest ever research programmes, with a total budget of €1.6 billion - the €800 million funding provided by Europe's aerospace industry being matched by a similar amount coming from the European Commission. Unfortunately, and as most of you know, Clean Sky has been struggling to get off the ground. The programme has been mired in administrative difficulties, with industry partners finding it hard to deal with severe constraints imposed by internal Commission regulations. Last April these difficulties had reached the point where industry feared that the programme would fail to produce the needed results on time. We then made it clear to the Commission that it had to take rapid action if Clean Sky were to be given a chance to deliver on its ambitious objectives.

Today I am glad to say that this message has been heard by the European Commission. We have now received reassurance that Commission services are exploring solutions to meet industry's requests, and we noted with satisfaction that an ad-hoc group had been set up within the Commission to facilitate and speed up decision-making on Clean Sky-related issues. These measures were confirmed during a meeting between industry and Commissioner Potoãnik, held on June 18th at the Paris Air Show.

Other positive developments over the last few months have been the appointment of Eric Dautriat as Executive Director of Clean Sky, in April, and the launch of Clean Sky's first call for proposals for R&D projects on June 16th.

We welcome this positive evolution, and in particular the European Commission's willingness to act swiftly in order to recover the situation and make Clean Sky a success. We as industry are ready to help the Commission in any way we can to build an effective partnership on this very important project, which will decide if Europe can build the new efficient aircraft that the market will need, and – beyond that - if our continent can become the world's leader in green aviation.

THE EU DEFENCE PACKAGE

In the last months, the European defence sector has been affected by the adoption of the 'Defence package' of two Directives, covering defence procurement and intra-community transfer of defence goods to enhance competition in Europe's defence markets. Our industry welcomed the adoption, in December last year, of the intra-EU transfers Directive. This text will contribute a great deal to the emergence of a genuine European defence equipment market, and to a further consolidation of the European defence industry. It will establish the basis for simplified national processes for the licensing of transfers of defence goods, services and information. Once transposed into national law, it should greatly facilitate cross-border movements of sensitive goods and technologies to governments and certified companies, therefore allowing the defence supply chain to operate more easily across national borders.

We have been less positive about the Defence and Security Procurement Directive, adopted in January this year, considering that it does not meet all its intended objectives. We are concerned that, while encouraging cross-border competition and trade, as well as transparency in defence and security markets, the text could be damaging to R&D investment and hence to the defence and technology base in Europe. Indeed, the Directive applies the logic of EU internal market rules which rigidly divide R&D and production phases, therefore reducing the incentives for defence capability investment by both the public and private sectors. Under these rules, one may wonder whether companies will invest in R&D if they cannot be confident of winning the resultant production.

Despite these reservations, we consider that, taken as a whole, the EU Defence Package is definitely a step in the right direction, which will lead to the emergence of a new environment, more conducive to the development and rationalisation of Europe's defence industry. It is now our task to work closely with public authorities to ensure that the benefits offered by this text are fully realised.

SPACE: THE STRATEGIC IMPORTANCE OF THE GMES PROGRAMME

Concerning space we warmly welcome the draft Commission regulation, presented in May 2009, on the bridge financing of GMES operational services for the period 2011-2013. GMES, for Global Monitoring for the Environment and Security, is a programme aimed at building and implementing a European capacity for Earth observation. The Commission's text provides for the granting of €150 million out of the EU budget for the operational phase of the GMES programme. We call on the EU Council and the new European Parliament to adopt this draft regulation and to recognise the strategic importance of GMES for Europe.

MESSAGE TO EU DECISION-MAKERS

Before moving on to the presentation of the industry data compiled by ASD for the year 2008, I would like to address a simple message to EU decision-makers, one month after the

election of a new European Parliament and before the appointment of a new Commission.
Our industries are strategic assets for Europe. They are world leaders in advanced engineering, and a vital part of Europe's prosperous economy. They are also one of the most R&D intensive sectors in Europe, as they dedicate more than 11% of their turnover to research and development. Fully 20% of their employees work in R&D - only in the pharmaceuticals sector is the proportion higher. Finally, they make a €30 bn positive contribution to the EU trade balance.
In a recent article, Simon Tilford, Chief Economist at the Centre for European Reform (a UK think-tank), called our sector "*a rare high-tech success for Europe*", emphasizing that "*it is precisely the kind of activity that Europe needs more of*". To quote Mr Tilford, "*there is plenty that EU and national authorities should be doing to ensure the future success of the industry*" – in particular "*increase their support for the development and commercialisation of new technologies*" and "*work with the industry to ensure that new technologies are developed and deployed in Europe*". "*Other countries, not least the US, provide more support for technology development*", he says.

Today we need EU institutions and European governments to increase investment in our industry, and in particular to raise their level of support for research and development activities. Investing in our growth-enhancing sectors will propel the whole European economy forward and will help us continue providing highly-skilled employment, technological innovation and environmental performance.

FACTS AND FIGURES 2008

I would now like to give you an overview of the performance of the European aerospace and defence sectors in 2008, based on data compiled by ASD.

In 2008, Europe's aeronautical sector has grown at a pace of 7%

In 2008 Europe's aeronautical sector (including both civil and military activities) recorded turnover of €98.5 bn, up from almost €96 bn in 2007. Had it not been for the weakening of the UK pound against the euro in 2008, these figures would have been significantly higher, as we had to reduce the value in euros of the UK contribution to the European industry. Without this the sector would have grown at a pace of 7% in 2008.
These good results mainly stem from the strong growth recorded in the first half of last year. The last months of 2008 were marked by a significant slowdown, as the effects of the global economic downturn started having an impact on our industry – especially in the civil manufacturing sector. Employment in the sector contracted by 1.2% last year – it was down to about 443,500 from close to 449,000 in 2007. This shows that our companies started adapting to the new economic environment last year, by launching restructuring processes to improve their efficiency, and by resorting to temporary contracts as tools for improving flexibility (these contracts are not included in our employment figures).

An illustration of the robust health of Europe's civil aeronautical sector last year can be found in Airbus's performance: in 2008 the Toulouse-based manufacturer delivered 483 aircraft, setting another company record. Airbus recorded 900 gross orders (the third highest ever for the company) and ended the year with a backlog at an all-time high of more than 3,700 aircraft. Our companies also beat delivery records last year in the regional aircraft segment, where ATR delivered 55 aircraft (up from 44 in 2007), as well as in the helicopter segment, where deliveries for both Eurocopter and Finmeccanica (through Agusta Westland) were up by 20%.
However the deterioration of market conditions started having an impact on some of our activities in 2008, in particular in general and business aviation which was the sector most severely hit by the economic downturn. In that segment European manufacturers only recorded 419 deliveries last year, down from 528 the year before.
In military aeronautics, 2008 was marked by the maiden flight of the first Eurofighter Tranche 2 aircraft, in January. In the last quarter, the first aircraft of this type were delivered to the German, Italian, Spanish and UK air forces. In total 22 Eurofighters were delivered last year. In France Dassault delivered 14 Rafale jets to the French Air Force last year, while in Sweden Saab continued to work to win new export contracts for its Gripen aircraft. A contract was signed with Thailand in February for a comprehensive defence package that included Gripen.

The A400M

2008 was a year of contrast for the A400M, the most ambitious military procurement programme ever undertaken in Europe. The first complete version of the new military transport aircraft was rolled out from its final assembly line in June last year. However, as we all know, in September, Airbus Military announced an undefined delay of the first flight of the A400M. There are high level political discussions taking place between Airbus and their customer governments and we are confident that we will reach a satisfactory outcome, leading to the successful completion of a programme that will provide Europe's armed forces with the new standard in military airlift.

2008 was a good year for the European space sector

Overall 2008 was a good year for the European space sector. Consolidated turnover grew by almost 10%, from €5.36 bn to €5.88 bn, and employment climbed above 30,000, follo-

wing a 1.7% growth. The industry benefited from a new cycle in geostationary telecommunications satellites, as well as from the relative stability of spending in government space programmes, both civil and military.
On the commercial side, satellite markets exhibited robust growth, driven by the cyclical evolution of satellite lifetime and the needs for replacement of orbital capacity. Geostationary telecommunications satellites were the most dynamic segment of this market in 2008, and this trend should be confirmed in the coming years. In the medium-term future, another source of growth for the commercial satellite market will be provided by the roll-out of the Galileo system, expected in early 2010 after the selection of the winning bid currently being assessed by the European Commission. The commercial launcher business (Arianespace) naturally benefited from the dynamism of the geostationary telecoms market, since Ariane primarily serves the needs of that market.
It should be highlighted that the evolution of the euro/dollar exchange rate continued posing serious threats to Europe's competitiveness on the global commercial market, for both satellites and launcher services.

About land and naval defence sector
For the land and naval defence sector, the figures I am about to present are based on estimates. Final data will be included in the ASD Facts and Figures 2008, to be published in October.

Still, the available data indicates that Europe's defence sector had a satisfactory year in 2008, with an estimated turnover increase of 6.5% from 2007. This growth was driven by a moderate increase in defence expenditure in some European countries, even though defence spending levels - in particular for equipment programmes – remain low in Europe. It was also bolstered by strong growth in military markets outside Europe, in particular Brazil, India, South Korea, Singapore, the United Arab Emirates and Saudi Arabia. Of course the U.S. remains, by far, the world's largest defence spender and has increasingly become a key market for many European firms, including my own company Cobham.

Concerning land systems, German firms Rheinmetall and Krauss-Maffei Wegmann achieved strong performances last year, while in the UK BAE Systems' munitions business secured a 15-year partnering agreement from the UK Ministry of Defence (MoD) covering the supply of approximately 80% of general munitions consumed by UK Armed Forces. Among the most dynamic segments of the land market last year were the through-life support business on the one hand, and the production of vehicle upgrades - in particular with the integration of digital systems - on the other hand.

In the area of defence naval systems, European companies had to cope with a severely depressed market for new vessels, as orders worldwide plummeted by 25 % compared to 2007. Good results were still achieved by the Italian-French FREMM Frigates programme, with the order by the Italian Navy of 4 more units to Fincantieri. The UK Future Aircraft Carrier programme also made further progress last year, with the signing in June of the manufacturing contract between the UK government and the BAE Systems-VT Group joint venture. Finally, European companies were still able to win important orders in a shrinking export market from countries such as Brazil, India and Morocco.

OVERALL FIGURES FOR THE EUROPEAN AEROSPACE AND DEFENCE INDUSTRIES

Working on the basis of estimates for defence land and naval activities, overall figures for the European aerospace and defence industries are the following:

- a turnover increase of 2.5%;
- a 0.3% increase in employment;
- and a marginal (0.06%) decrease in the volume of R&D investment.

These figures show that our industries held their own in 2008, despite the deterioration of economic conditions which started to be acutely felt during the second half of the year. Overall our companies proved able to adapt to this new, more challenging environment, by launching restructuring processes, but also by accelerating their expansion outside Europe, in particular in the US and Asia – mainly through acquisitions and investments in production facilities.
Of course we are concerned that falling global growth rates, coupled with shortages of consumer finance, will have a more severe impact in 2009. We remain particularly vigilant over the situation of our SMEs, which provide the backbone of Europe's aerospace and defence industry. Preserving our supply chain in this difficult period is crucial to ensure that our industry will be fully operational when the economy (and global demand) start growing again.
ASD represents 2000 companies, in Europe with annual revenue of $175bn employing 650,000 people. There is no doubt that our success today is underpinned by yesterday's investment in R&D, in new programmes and in education and skills provision.

I continue to regard myself very fortunate to work in an industry that is dynamic, exciting, demanding and full of interesting people. Thank you ladies and gentlemen."

TsAGI: TODAY AND TOMORROW

By Sergei L. Chernyshev

Sergei L. Chernyshev is Director General of the Central Aerohydrodynamic Institute.

Currently TsAGI is the major Russian Aeronautical Research Center with the unique experimental basis that meets all the requirements of modern sciences. Within the world, there is no analogue to the legendary wind tunnel complex (c. figure p.8), to the facilities to perform the versatile strength tests, to the acoustic chambers complex, to the hydrodynamic tests facilities and the flight simulators. Theorists, experimentalists and designers work at the institute. Furthermore, it is to be mentioned that there is hardly another knowledge area where the experiment plays such an exclusively important role. It is because the overwhelming number of problems cannot be solved analytically on account of great number of influencing factors. The observations and the experiment enable only generating the adequate mathematical models and elaborating the engineering computation approaches based on them. It is in TsAGI where the great attention is paid to the experimental basis that has made it possible to perform all the tests and to obtain the resulting inventions.

Naturally, we devote a lot of time to issues of advanced development and of military aeronautical engineering. Nowadays, the fourth generation aircrafts are to be changed by the fifth generation aircrafts. Moreover, the airplanes of the sixth generation can be foreseen. Each of the promising aircraft generations differs from the previous ones through a set of novel features, specified by military customers and by the market as a whole. E.g., the qualititatively novel characteristics of next-generation maneuverable aircraft are as follows: high level of camouflage properties, supersonic cruise flight and extremely high maneuverability. In order to implement these properties, TsAGI carries out the integrated research investigating the non-conventional aerodynamic configurations, including the large scaled models experimental investigation.

Recently the attention is growing and focusing at flight safety supporting; virtually it is getting the first priority where the human factor constitutes 70-80%. The innovative flight personnel training means are under development in TsAGI.

TsAGI is successfully co-operating with major aerospace companies and research institutes in the world

Owing to the fact that TsAGI has accumulated an enormous experience in area of science and experiment, the institute is successful in cooperating with more than 50 major aerospace companies abroad and research centers in America, Europe and Asia. Among the Institute's joined partners are: Boeing, Lockheed Martin, EADS, Airbus, Snecma, Dassault, Alenia, HAL, NASA, DLR, ONERA and so on.

For many years the annual workshops of TsAGI — ONERA, that are two leading aerospace research centers in France and in Russia, are held already. The cooperation facilitates the contacts between young Russian and French specialists and the major scientists as well contributing to the harmonization of joined scientific activities within the bilateral agreements.

In 2009 TsAGI and DLR signed a framework agreement on cooperation in fundamental and applied aeronautical sciences area. This cooperation is intended to enhance the long-term partnership of these research centers. The document reconfirmed the agreements obtained on cooperating in area of developing and implementing jointly the young scientists training programs, when organizing the scientific conferences and workshops.

Participation in European Union FP Projects

The participation of TsAGI in EU FP (European Union Framework Programmes) projects is one of the perspective trends in international cooperation. Currently, TsAGI has more than 20 active projects within the FP6 and the FP7.

- E.g., TsAGI is involved in FLYSAFE project that is focused at creating the integrated aeronautical system to enhance the flight safety in all weather conditions and to improve accident protection system.
- Within HISAC (high speed aircraft) project, the key activities of the Russian team, TsAGI constitutes part of, are targeted at investigating the feasibility of achieving the low-level sonic boom for the supersonic business jet.
- Within DREAM (valiDation of Radical Engine Architecture systeMs) project, TsAGI designs and manufactures a number of bi-rotary propeller models and performs its acoustic and aerodynamic tests inside TsAGI's T-104 and T-107 Wind Tunnels.

Under the joint decision of Ministry of Industry and Trade, Ministry of Education and Science and EC, TsAGI is appointed to be a National Contact Point to provide the

coordinated cooperation with EU and European countries. TsAGI plays an important role in enhancing the mutually beneficial links with European countries in aeronautics.

Participation in space programmes

The knowledge of TsAGI scientists, accumulated when carrying out the Russian national programme on "Buran" aerospace vehicle development, made it possible for TsAGI to participate greatly in many of actual and perspective space programmes. From year to year, TsAGI will sufficiently increase its participation in and contribution into scientific supporting the major part of space projects, in particular in contents and in work scope.

Attracting young specialists

Thus, TsAGI has as the key aim to retain the present staff and to make attractive the aeronautical activities for the young specialists. The establishing of the large-scale national aviation center in Zhukovsky will facilitate it: it is high time to consolidate Russian aeronautical research organisations. Thus, my point of view is that it will be possible to manage the researches, to eliminate the duplication and to solve public challenges much more efficiently. The educational objectives and economic aspects are also included. It should not be forgotten that aeronautical researches are extremely expensive. I would like to underline, that not only money are meant, but the human lives as well. The lack of knowledge in aviation causes the accidents. Therefore, the highly developed aeronautical science is the guarantee of success and progress in all aircraft vehicles evolution.

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Mig 29 T-101 mock-up in course of aerodynamic tests in the wind tunnel of TsAGI. (Credit TsAGI)

NLR – LOOKING BEYOND THE HORIZON FOR 90 YEARS

By Frank Vos, Head of External Communication, NLR

NLR has celebrated its 90th anniversary on April 5, 2009 an ideal opportunity to review the past and, more importantly, to look to the future. On this occasion, we have cast our eye further over the horizon: which roles will UASs (Unmanned Aircraft Systems) play in 2030?

This question reflects the future-driven spirit that has prevailed at NLR for the past 90 years. This spirit is captured by the permanent exhibition in the former wind-tunnel building on the NLR grounds in Amsterdam. Further testimony is provided by a book on NLR history, which will be published this year, confirming that NLR has had its sights set on the future since the early years of aviation.

It all began in the Old Sawmill on the navy compound in Amsterdam, where the National Aviation Research Institute (Rijksstudiedienst voor de Luchtvaart, RSL) was based from 1919 to 1940. The first plans were devised by the 25-year-old Albert Gilles von Baumhauer, who was to become deputy director of the RSL. His vision included research departments for aircraft, aerodynamics, structures and materials, and engines. And in the very first year, the Old Sawmill already had a wind tunnel, based on a design by Gustave Eiffel. The propeller for this tunnel still graces a wall in the entrance hall of the NLR building in Amsterdam.

THE NLR MUSEUM

The NLR museum presents an excellent overview of NLR's history. Visitors will find intriguing examples of concepts and ideas that later went on to become a huge success in the aviation industry. This spirit of innovation lives on at NLR to this day. We'll be celebrating this spirit with a major conference on the future of aviation, to be held in Amsterdam on October 7.

UNMANNED AIRCRAFT SYSTEMS WILL PLAY CRUCIAL MILITARY ROLE

In 2030, unmanned aircraft and helicopters will be indispensable for military operations. These innovations will ensure that fewer soldiers are killed and that acquisition and maintenance costs are substantially lower than for manned vehicles.

In the future, Unmanned Aircraft Systems (UASs) will be exceptionally suitable for mine detection, counter-submarine surveillance, pursuing drug smugglers' and pirates' boats, for safeguarding military bases and transport routes, and as launch platforms for light missiles.

The military are already using UASs on a modest scale. Dutch troops in Afghanistan operate the 300-kilo Sperwer on surveillance flights, for example. The US Air Force has successfully operated combat missions with the 4,700-kilo

NLR is already experimenting with very small and highly maneuvrable 'quadrocopters'. (Credit NLR)

Reaper. Operating UASs has major benefits. The soldiers themselves remain out of range and the cost of purchasing and maintaining small UASs is relatively low. They are also much quieter than manned aircraft. Manned helicopters require longer rotor blades, and their high rotation speed causes shock waves announcing their presence ahead of arrival. The small UAS helicopters remain unnoticed for much longer. An added advantage for the navy is the smaller hangar space they require on board.

In 2030, combat troops will have a wide range of UASs at their disposal, varying from large aircraft able to carry missiles, to very light surveillance models that remain practically unnoticed and can even be flown inside buildings. NLR is already experimenting with very small and highly maneuverable 'quadrocopters'. The latter can be maneuvered along narrow passageways and can cover impressive distances at high speeds to take aerial photographs or video footage at given coordinates. They are so small that they are practically invisible in the open landscape.

In ten to twenty years' time, UASs will offer a welcome support for peace-keeping operations in urban areas, where lack of overview remains a major problem. Unmanned combat operations will also be feasible. However, very strict rules currently apply to the use of offensive fire-power. A target must be unequivocally identified as hostile before firing on it. UASs will only be allowed to launch an attack autonomously in exceptional circumstances. Not even controllers on the ground, following the UAS with a data link, will always be capable of achieving the certainty required before launching an attack. They will, for example, have to be very familiar with the sensors of their UAS in order to make a well-founded decision. For example, color values can vary in visual imagery, and the location of a target is difficult to assess from the ground.

NATO will mark its vehicles and combatants cryptographically with an Identification Friend or Foe (IFF) code, thereby reducing the risk that they will be accidentally hit by friendly fire.

NLR-UAS FOR RESEARCH

In the years ahead, NLR will focus on assessing and certifying UASs and MAVs for civil and military operation. The aircraft will be better equipped for specific tasks and their control and sensor systems will be integrated. Integration plays a major role in the further development of UASs. All the components must be developed in close conjunction with each other. In the case of helicopters UASs, for example, rotor design must take into account the vibration sensitivity of sensors. The aircraft will require thorough certification before they can be deployed for a wide range of tasks inside and outside conflict areas.

NLR also supports new research and development initiated by industry. The institute is, for instance, helping a Dutch consortium develop a helicopter UAS. The first of these will be delivered to NLR for its research program. The NLR laboratory aircraft, the Metro, has already been adapted for research into reliable and safe UAS deployment. The aircraft will this year be modified so that it can operate as a UAS from the ground, albeit under the supervision of a test pilot.

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Unmanned Aircraft/Helicopter Systems will play crucial militay role in the future. (Credit Geocopter)

SESAR

The Single European Sky ATM Research (SESAR) activities and the corresponding Joint Undertaking (SESAR JU) are currently the subject of numerous publications, discussions and questions. With issue 4-2008 the CEAS bulletin started a series of articles describing the SESAR framework. While the first article covered the basic background of SESAR, the underlying process and its current status the second article will focus on the SESAR Long-Term Innovative Research (LTIR) Programme.

Both authors, Dr. Colin Meckiff and Prof. Dr. Peter Hecker, are strongly involved in this Programme.

Dr. Colin Meckiff is based at the Eurocontrol Experimental Centre at Brétigny sur Orge, France, and leads SESAR Workpackage E on behalf of the SJU.

Prof. Dr. Peter Hecker is member of the Administrative Board of the SESAR JU. In addition Prof. Hecker recently was elected as a member of the SESAR JU Scientific Committee. He acts as member of the board of directors of the "Association for the Scientific Development of ATM in Europe" (ASDA).

The need for long-term & innovative research

Arguments for a positive approach to long-term research and innovation in all branches of industry are well understood. In particular, the need to build the European economy on strong foundations of knowledge, research and innovation is forcefully reiterated in many EU declarations and treaties, and is seen as the key to growth, jobs and prosperity.

This is as true for air transport and ATM as it is for any other industry. It is vital that research competence is built and maintained so that Europe can play a significant and lasting role in the global arena, and for this a framework is needed that will maximise potential returns in this traditionally under-funded area.

The SESAR Definition Phase acknowledged that need. Deliverable D4 states that "...it is very important that creativity and innovation are stimulated today in preparation for the future improvements and that appropriate levels of investment funds and resources are put in place to address these planning horizons, i.e. beyond the 2020 target... As with other industrial sectors, ATM research should be promoted within academia, serving the dual purpose of stimulating creativity whilst preparing staff for tomorrow's applications."

In order to address this, a specific workpackage, Workpackage E (WP-E), was proposed and subsequently retained as part of the SJU's work programme.

The WP-E vision

The contribution of WP-E will be twofold: First, it will be a catalyst to create a healthy European research capability for ATM and related air transport that will persist beyond the lifetime of the SESAR development programme (the SJU). Secondly, it will make provision and provide funding for research activities that are not currently planned within the 'mainstream' SESAR workpackages. Such research will address applications that will become operational beyond the SESAR timeframe (nominally 2020), and will also allow for innovative work that may have application in the nearer term.

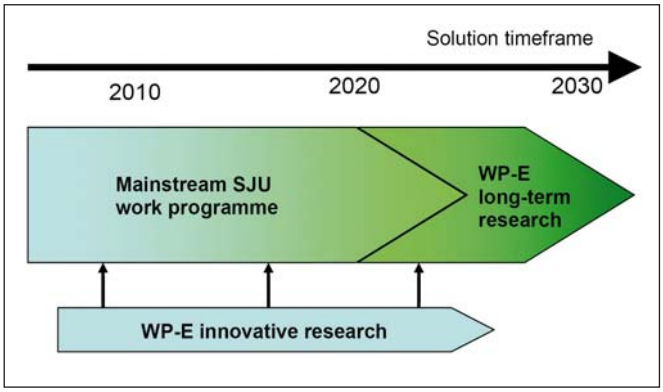


Figure 1: Scope of work package E (graphics: SESAR JU)

How WP-E works

WP-E will use two functional instruments:

Research networks provide a structured way to build research knowledge, competence and capability that should serve the

industry in the long term. Each network will be made up of partners from academia, research establishments, industry etc. that share a common expertise or interest in a relevant air traffic management or transportation domain.

Research projects will explore new ideas essentially for the long term, but which may also be targeted at innovations applicable in short- and mid-terms. As with the networks, projects will be multi-disciplinary undertakings.

Networks and projects will be selected following open calls. The first call for network proposals is imminent and will, assuming bids of sufficient quality are received, result in 3 networks being launched by the end of the year. This will be followed by further calls in early 2010 for PhD studies (which are expected to be 'hosted' by the networks) and projects. The total number of funded activities will depend on the overall cash budget available to WP-E, which is currently set at €23m.

Research Themes

The research themes were developed following consultation with experts in academia, industry and research organisations as well as the SJU and the European Commission. Principal considerations were the potential for added value to the existing SESAR work, the need to think beyond the current SESAR timeframes and the potential for paradigm shift. In addition, it is a stated objective of WP-E to try to engage new academic disciplines in ATM research, and finally it is necessary to avoid overlap with other European activities (e.g. CleanSky).

The number of themes is initially limited to four to provide the focus needed given the limited resources available. They will be reviewed and revised as necessary as the work progresses, with additional themes likely for second and subsequent calls. The themes serve as guidelines for those wishing to submit proposal for networks or projects. Themes are deliberately described at a high and broad level since it is expected that those proposing projects and networks will interpret and enrich them according to their own expertise.

Each of the four themes is briefly outlined below. More details are available on the web site, and in particular in the Thematic Programme, which is a downloadable document.

Theme 1: Exploiting 4D to the max

This research theme will contribute to the concept of precision 4D trajectory operations, which are envisaged for the long-term. In particular it will allow for modelling and analysis of a system that makes extensive use of precision 4D trajectories. Research in this theme might cover:

- Modelling an ATM system that includes thousands of precision 4D flights and hence exploring performance capabilities and limitations with regard to elements such as capacity and safety;
- Developing design principles for a system based on precision 4D trajectory operations explicitly considering the requirements of all relevant ground and air subsystems; also developing principles for a standard trajectory algorithmic baseline including system-wide time synchronisation and controlled time of arrival (CTA);
- Implications for human controllers working in a precision 4D environment;
- The balance between a system based on precision trajectory operations and the need for flexibility and resilience.

Photo: Deutsche Flugsicherung GmbH

Since 4D trajectory-based operations are an integral part of the SESAR concept, some related work is already planned within other SESAR workpackages. This means that research undertaken here must be distinctive, and must represent a clear extension to mainstream developments.

Theme 2: Towards full automation

The current SESAR Concept of Operations was developed with the requirement that "humans will constitute the core of the future ATM System's operations". This precept imposes significant constraints on conceptual thinking, so this theme gives an opportunity to push back the barriers and freely explore new automation possibilities. The research will therefore study the application of high degrees of automation to one or several components of the air traffic management system (with or without the involvement of human operators) taking into account transition issues. This may include:

- Understanding the benefits and limits of high degrees of automation, up to and including 'full' automation;
- Identifying which functions in the ATM system could and should be automated;
- Research covering algorithms, tools and prototypes;
- The integration of airborne and ground-based systems together with a heterogeneous user (aircraft) population in a highly automated environment;

Photo: Fraport AG

- Assessing the performance of a highly automated ATM system with regard to criteria such as safety, reliability and quality of service.

Human factors, reliability and safety need to be considered in particular if varying degrees of automation are to co-exist across different ATM sub-systems.

Theme 3: Mastering system complexity

This theme focuses on air traffic management as a system of systems, with the objective of characterising the sources and consequences of its complexity. This has the potential to provide valuable insight into the system-wide impacts of change that today may not be well mastered.

There are at least two broad areas of interest. The first is to understand the emergent behaviour of the overall system when changes are introduced in one or more subsystems. Many changes have been applied to ATM in recent years, in some cases without a full understanding of the potential consequences. SESAR also plans to make a large number of 'improvements', but will these changes make the overall system better or worse? Safer, or less safe? Could they have consequences that are hidden from traditional validation approaches? How and in what sequence should they be introduced? The science of complexity could help answer some of these questions.

The second area of interest concerns the overall architecture of an ATM system where modernisation can be a painfully slow process. An overriding concern for safety is often the excuse for the slow adoption of new procedures or technological changes. However, this argument does not explain why the airborne innovation cycle takes only 7-10 years, whereas for the ground system 15-20 years is the norm. Has the ATM system become too complex, too tightly coupled? Have we lost control of the interdependencies and feedbacks between its subsystems? Furthermore, one could ask whether problems of complexity are purely technical or whether they are at least partly institutional.

This research theme has the potential for suggesting resilient and agile designs which are more conducive to the safe and expeditious introduction of new technologies or operational procedures. Methodologies may be developed to help decide which local or subsystem changes will most effectively generate required performance improvements.

Theme 4: Economics and performance

This theme looks at long-term economic and performance issues associated with the ATM system as foreseen in the SESAR concept and beyond. It is expected both to apply traditional methods and to develop innovative approaches. In particular it will examine how economic factors can be used to drive new developments in the ATM system.

This theme seeks to explore the application of new economic mechanisms to influence the future ATM system. The following are some considerations that will condition this research:

- Increased privatisation and corporatisation of ATM service providers, together with European regulatory developments, has resulted in a push towards ***performance-based costing*** of service provision with quality of service measured by metrics such as capacity and delay.
- The SESAR operational concept is built around the idea of a ***business trajectory*** which means that users of the airspace can request to fly based on how they value a trajectory, which itself is a function of their business model. This may significantly impact operations.
- Sensitivity to the ***environmental impact*** of aircraft (noise and local and global emissions) is giving rise to new schemes to make users pay for the 'right to pollute'. Charging policies together with trading and regulatory measures will become increasingly important, with an impact on operational procedures, business models and growth potential. Airspace and airport slots are other examples of commodities that will be increasingly attributed monetary value giving rise to further ***trading options***.
- New ***business models*** (both airlines and ANSPs) may emerge to play an important role in future evolutions of ATM. In addition there may be a greater ***diversity of airspace users*** including more light jets, UAVs and other airborne systems that have varying and sometimes incompatible operational requirements.
- Innovative business analysis techniques (both quantitative and qualitative) may be needed to support the development and evaluation of new concepts.

WP-E Management

WP-E is managed on behalf of the SESAR Joint Undertaking by a small team based at the EUROCONTROL Experimental Centre in Brétigny-sur-Orge, France. The SJU Scientific Committee (see below) will take a particular interest in Workpackage E to advise on thematic content and strategic direction.

For all issues concerning Workpackage E the web site is the definitive source of up-to-date information (www.sesarju.eu/public/standard_page/wpe.html). In particular the Workpackage E Thematic Programme document, giving more details on the four initial research themes, can be downloaded.

The SESAR Scientific Committee

In order to guarantee high level academic contribution to the SESAR programme the SESAR Joint Undertaking has recently established a Scientific Committee. This Committee will support the Executive Director and will give advice on scientific and methodological aspects of the work programme and on the scientific quality of its results in research and development. In particular, the Committee will play an active role in support of long term and innovative research. It will focus on:

– the scientific analysis of SESAR from different angles: economics, human factors, statistics, mathematics, computer science, physics, technology;
– the liaison between SESAR and the academic and scientific communities across Europe including education of the future "SESAR interested engineers & scientists" and
– the validity, scientific coherence and value of the SESAR results.

The Scientific Committee comprises 12 renowned European visionaries and leaders from academia and research institutes. The full list of members is given on the SESAR Joint Undertaking web site (http://www.sesarju.eu/public/news/090818_scientific.html). The Committee is expected to start its activities in autumn 2009.

"Having these personalities on-board will enable SESAR to build on sound scientific foundations. Thanks to the contribution of the Scientific Committee, SESAR JU will establish strong links with academic institutions conducting applied research of relevance to us. We strive for an innovative approach at SESAR and the input of the Scientific Committee will stimulate the technologists and engineers to think out of the box and deliver breakthroughs in ATM research." commented Patrick Ky, Executive Director of the SESAR Joint Undertaking.
The following article on SESAR will focus on the first set of Research Networks and Projects funded by the SESAR Joint Undertaking.

Reference:

This article is based on material from the following sources:
– SESAR JU website www.sesarju.eu, especially the Thematic Programme (downloadable)
– EUROCONTROL, www.eurocontrol.int

EDA'S ANNUAL CONFERENCE : HELICOPTERS: KEY TO MOBILITY

On 10 March 2009, the European Defence Agency (EDA) held its annual conference. The subject dealt with was: Helicopters – Key to mobility. After the opening addresses by Alexander Weis, Chief Executive of the EDA, and the Keynote speeches successively delivered by Javier Solana, Secretary General – High Representative and Head of the EDA, General Henri Bentégeat, Chairman of the European Union Military Committee, and Allan Cook, President of the AeroSpace and Defence Industries Association of Europe –ASD), two sessions were organised:

- *Panel 1, chaired by Michael Codner (Royal United Services Institute): "Setting the scene – Operational needs, current situation, lessons learned." The purpose of this session was to identify the operational requirements, the scope and the scale of the challenges we are facing, allowing better solutions from national, intergovernmental and industry sides.*
- *Panel 2, chaired by Sir Christopher Coville (Chairman of Westland Helicopters Ltd and Chairman of ASD Rotorcraft Group: "Potential solutions". This panel looked at the solutions put forward by industry to the problem of helicopter shortfalls.*

CONFERENCE SUMMARY

At the end of the works, EDA's Chief Executive Alexander Weis gave an on-the-spot summary of some of the key points that he had noted during the day. Wide excerpts from his speech are reproduced here below.

" I am now facing the challenge of summarizing the essentials of today's discussions – and the most promising ideas. I would like to emphasies that it is an initial assessment – and your excellent ideas will be considered in detail.

Medevac (medical evacuation)

[...] we learned today how important it is to have such a capability to have a positive impact, in particular on the morale of our troops. The idea could be to have a modular approach for 'medevac' kits to be integrated into different airframes [...].

Standardising simulators

The second issue that comes to my mind is we could standardize simulators terrain model databases. We all use simulators for training. And all these simulators are using terrain model data. But do we use all the same terrain model data? I suppose in each and every simulator, we have at least one terrain model data for Afghanistan, maybe another for Chad. Why do we not standardize the terrain model data in order to create a kind of joint training in a virtual environment? [...]

Common standards for multinational training

[...] A key issue this morning was common assessment that we have to trust in our aircrews capabilities. The definition of common standards for multinational training could be the right way to be surer in our aircrews' capabilities.

Integrated support solutions

[...] NAMSA (NATO) is working in this area and their work is quite advanced. [...]I am not sure that this would be a promising area for EDA's work. [...]

Transatlantic co-operation

[...] we need co-operation and competition. The second point is an assumption from my side. We need cooperation and, even more, we need a transatlantic cooperation. [...] for me it's very important to open the door towards a transatlantic co-operation.

Military requirements

What do we need in order to have a proper and successful co-operation – not only a transatlantic one? We need a harmonized set of military requirements; and, again, it's important to talk to industry, to listen to the technical experts from industry; it is of importance to make something like "requirements controlling" – to know how expensive a requirement will become to come to 75% solutions. [...]. So, we need a set of military requirements from the Member States taking part in the EDA. [...].

Specialise more in R&T

[...] I think it is an illusion to expect, in the current situation, an increase in the defence budgets. [...]. What we can do already today and tomorrow is to spend more together and, by this, spend it in a in a better way. [...]. And this is what EDA is for: to spend the scarce resources more intelligently though a better co-operation.

I would like to refer to the Future Transport Helicopter, because it looks like we had a competition in Europe and competition on the US side. So, it looks very promising from a customer's perspective, and I would like to congratulate this situation. Again, co-operation, also transatlantic co-operation, and competition in Europe, in the US, sounds great.

On the left: Javier Solana, Secretary General – High Representative and Head of the European Defence Agency.
On the right: Alexander Weis, Chief Executive of the European Defence Agency.

Upgrades

[...] we have also to work on upgrades of existing helicopters – and I have to say that from all types of existing helicopters. I can clearly understand the interest of the eastern European industries (...also the Ministries of Defence) to see their helicopters upgraded. [...] what we have to do is to group those Member States operating the type of helicopters and we have to propose a cooperative approach for this upgrade."

For further information, read the special edition of the EDA Bulletin "EDA'S ANNUAL CONFERENCE" helicopters'09 - key to mobility
www.eda.europa.eu – info@eda.europa.eu

FUTURE TRANSPORT HELICOPTER

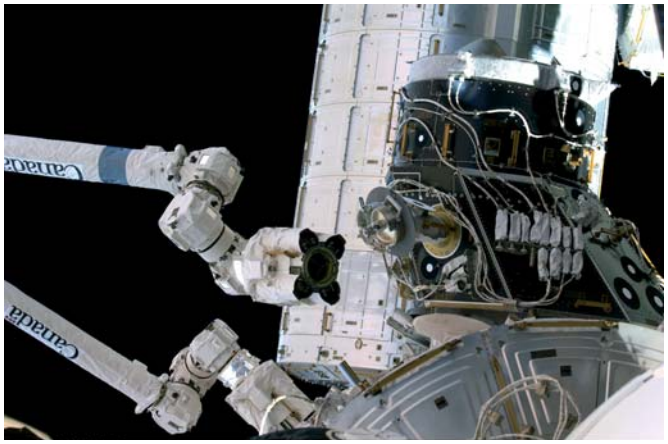
On 18 May 2009, the EDA Ministerial Steering Board approved the launch of a Category B programme to develop a Future Transport Helicopter (FTH), based on the Franco-German common preliminary requirement. The programme provides for the development of a heavy transport helicopter (32-35 tonnes) by 2020 to replace the current fleet of CH-47 or CH-53. The Progamme offers potential for co-operation with the United States. It will also leverage work from the European Commission on the Green Helicopter initiative and foster R&T co-operation.

At the same Steering Board meeting EDA presented Ministers of Defence with upgrade packages and associated roadmap for the Mi-17 helicopters. A proposal will be sent by EDA to Member States addressing co-operation models, with the aim of launching upgrade projects before the end of 2009.

For further information, please consult the EDA bulletin Issue 12 – June 2009
www.eda.europa.eu – info@eda.europa.eu

EDA Steering Board meeting in Defence Ministers formation

DE WINNE OPERATES INTERNATIONAL SPACE STATION ROBOTIC ARM



Pressurized Mating Adapter-3 was relocated using Canadarm2 (Credit ESA)

De Winne and Thirsk at the controls of Canadarm2 (Credit ESA)

On Friday 7 August 2009, Frank De Winne operated the ISS robotic arm to relocate a docking adapter on the outside of the Station's Unity module.

Together with Expedition 20 crewmate Robert Thirsk, and in close coordination with flight controllers on the ground, De Winne operated the 18-metre robotic arm from inside the ISS.

In a procedure lasting six and a half hours, on 7 August between 09:00 UT and 15:30 UT, the Pressurized Adapter-3 (PMA-3) was moved from Unity's Earth- facing port (nadir), to the module's port side common berthing mechanism using the ISS's robotic arm, Canadarm2. After De Winne and Thirsk had grappled PMA-3 and released the adapter from Unity's nadir port, commands sent from the ground then maneuvered Canadarm2 towards PMA-3 new location on the left-hand site of Unity.

PMA-3 is one of three conical Station mating adapters which are used to interconnect spacecraft and ISS modules that have compatible docking mechanisms. The PMA-3 relocation was needed to to prepare Unity's port common berthing mechanism for the arrival of the European-built Node 3 module, named 'Tranquillity' by NASA, and the Cupola observation module early in 2010.

Commenting this mission, De Winne said: "*It went very well, actually almost as in the training, even better. The arm flies very stable and the hand controllers are better than in the simulators – they don't get used eight hours every day!*"

View of the International Space Station on 28 July 2009. (Credit ESA)

From ESA Press Release dated 12 August 2009.

"ALISSE" MISSION: ESA'S SWEDISH ASTRONAUT CHRISTER FUGLESANG RETURNS TO THE ISS, TO DELIVER AND RETRIEVE HARDWARE

STS-128 was Christopher Fuglesang's second spaceflight. (Credit ESA)

The crew of seven included ESA astronaut Christer Fuglesang of Sweden, on his second spaceflight, a mission dubbed "Alissé". The launch took place on 29 August 2009 at 05:59 CEST from Pad 39A at the Kennedy Space Center with Space Shuttle Discovery. On entering the Station, Christer Fuglesang was welcomed by fellow Frank De Winne, aboard since 29 May. This is the 15th flight of an ESA astronaut to the ISS in 8 years and the 3rd time in less than 3 years that two ESA astronauts will be onboard the ISS simultaneously. Docking with the ISS occurred on mission day three, Monday 31 August at 03:03 CEST.

THE STS-128 MISSION

Why "Alissé"? This name refers to the trade winds exploited by European sailors since Columbus to reach the New World.

The main STS-128 mission objective was to deliver cargo and equipment. In addition, NASA astronaut Nicole Stott replaced fellow astronaut timothy Kopra as a permanent ISS crew member.

Christer Fuglesang was in charge of operations involving the Italian-built Multi-Purpose Logistics Module (MPLM) Leonardo – a cargo module the size of Columbus -, and participated in three spacewalks.

Carried into orbit inside Discovery's payload bay and then temporarily docked with the ESA-delivered Harmony Node-2 module, Leonardo provides a pressurised environment for three life-support and three science racks which were transferred into the ISS.

DEEP FREEZING IN ORBIT

The science racks include the second Minus Eighty Laboratory Freezer "MELFI-2" supplied by ESA, which provides very low temperature storage for samples and experimental results, as well as the first ISS research laboratory fully dedicated to Material Sciences: ESA's Material Science Laboratory. "MELFI-2" doubles the capacity provided by "MELFI-1"which has been in operation onboard the US Destiny Laboratory.

Leonardo's payload also includes food, clothes, water and additional astronaut "sleeping quarters".

29 August 2009: launch of Space Shuttle 'Discovery' on the STS-128 mission. (Credit ESA)

THREE SPACEWALKS

Fuglesang's mission covered operations conducted both inside and outside the ISS. As a qualified Mission Specialist with a specialization in Extravehicular Activities (EVA), he took part in the second and the third of the mission's spacewalks, on 3 and 5 September, together with NASA astronaut John Olivas. The main objective of these two EVAs was to install more than 20 metres of vital cabling outside the ISS to prepare for the arrival of the ESA-provided tranquility Node 3 module in 2010. In parallel, the astronauts also removed and replaced a depleted Ammonia Tank Assembly (ATA) used as part of the ISS active thermal control system. At 800 kg, this was the heaviest object ever manipulated in space by a single astronaut.

The EVA of 1st September was dedicated to the retrieval of the European Technology Exposure Facility (EuTEF) currently mounted on an external payload facility outside ESA's Columbus laboratory module, and its storage in Discovery's cargo bay for its return to Earth. Designed to expose various sample materials and experiments to the vacuum of space, this facility has been returned to Earth inside Discovery's payload bay. This science package, which incorporates nine experiments designed to expose samples to the harsh conditions of space, test materials, analyse the near Earth orbit environment and take pictures of the Earth, has been operating for 18 months.

RETURN TO EARTH

Discovery undocked from the ISS on 8 September, bringing back NASA astronaut Timothy Kopra from the permanent crew, who has been replaced onboard by NASA astronaut Nicole Stott, launched with STS-128. Landing in Florida took place on 12 September at 02:53 CEST (00:53 TU).
Frank De Winne will remain on the ISS until late November 2009, assuming the 'commander seat' in October.

From ESA Press Releases
www.esa.int/SPECIALS/Alisse/index.html

MONITORING OF VOLCANIC ACTIVITY FROM SATELLITE : A SUPPORT TO AVIATION CONTROL SERVICE

by Dr Jos van Geffen, Institut d'Aéronomie Spatiale de Belgique

Volcanic eruptions can emit large quantities of rock fragments and fine particles (ash) into the atmosphere as well as several trace gases, such as carbon dioxide (CO), sulphur dioxide (SO_2), bromine monoxide (BrO), and water vapour. These volcanic ejecta can have a considerable impact on air traffic safety and on the human health. Ground based monitoring is only carried out at a limited number of volcanoes and, in fact, most volcanoes are not monitored on a regular basis. Satellite observations of sulphur dioxide (SO_2) and aerosols may therefore provide useful complementary information to assess, on a global level, the possible impact of volcanic eruptions on air traffic control and on public safety. Such is precisely the aim of the SACS programme (Support to Aviation Control Service).

HAZARDS TO AVIATION

Of the volcanic ejecta, the larger rock fragments usually fall back to Earth close to the volcano. The lighter ash and the gases, however, can rise high into the troposphere and even reach the lower stratosphere, up to 15 or 20 km, depending on the type of volcano erupting. Since airlines fly usually at 10-12 km altitude, aircraft may encounter volcanic ash clouds along their route.

The ash emitted by volcanic eruptions is a major hazard to aviation. The ash can, for example, severely damage the material of the aircraft, it can clog its sensors, it can limit the view of its pilots, and it can severely scratch ("sandblast") the windows of the aircraft. And when it enters the aircraft's engines, the ash can melt (it has a melting point of about 1100°C), as a result of which the engine may fail (*figure 1*).

More than 90 aircraft have sustained damage after flying through volcanic ash clouds. In at least 7 cases this resulted in temporary loss of power of one or more of the engines. In three cases, a Boeing 747 lost all four engines (1982 and 1989); fortunately the engines could be restarted once outside the ash cloud, but meanwhile the aircraft had dropped several kilometres. The ash emitted during the eruption of the Pinatubo volcano in 1991 is known to have damaged aircraft as far away from the volcano as 1000 km (*figure 2*).

Every year there are about 60 volcano eruptions. On average the ash cloud of 10 of these eruptions reach flight level along major aircraft routes. The total cost of the damage sustained by aircraft due to volcanic ash clouds in the period 1982-2000 is estimated at 250 million US dollar. So far none of the incidents have resulted in fatal accidents or of people being injured.

Of the gases emitted during a volcano eruption, sulphur dioxide (SO_2) is in itself also a hazard to aircraft, as SO_2 reacts with water vapour to form sulphuric acid (SO_4H_2), which is corrosive and can therefore scratch the paint and the

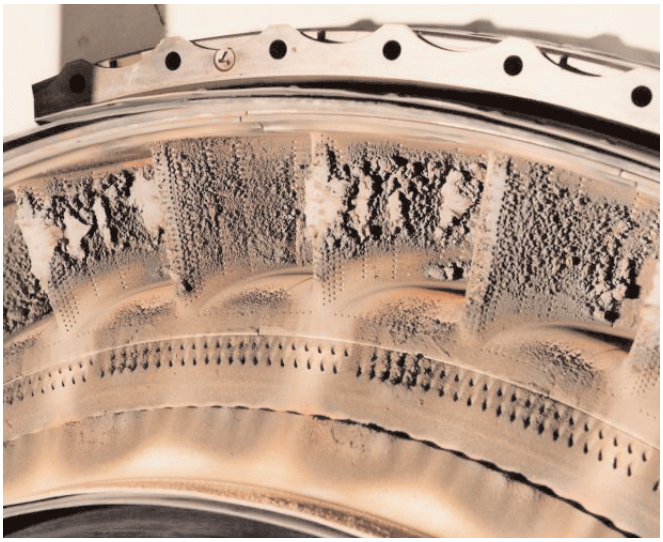


Figure 1. Damaged part of a Boeing-747 engine after flying through an ash plume, June 1982. [Photo: Eric Moody, British Airways]

windows of the aircraft, and it can create sulphate deposites in the engines. Depending on the kind of eruption, the SO_2 may be inside the ash cloud.
From all these considerations it is clear that the safest procedure for aircraft is to stay clear of volcanic clouds. But pilots cannot always see an ash cloud, e.g. at night, and the ash does not show up on radar. And SO_2 and SO_4H_2 are colourless gases, therefore invisible. If it penetrates into the aircraft, sulphuric acid is noticed easily because of its strong smell, but then the aircraft is already inside the cloud. Hence, it is of major importance to know in advance where volcanic clouds are and whet elevation they reach.

Figure 2. Heavy ashfall from the 1991 eruption of the Pinatubo volcano in the Philippines caused this World Airways DC-10 to set on its tail. About 4 cu km of ash was erupted on 15 June. It accumulated to depths of 10-15 cm at this airfield at the Cubi Point Naval Air Station, 40 km SSW of Pinatubo. [Photo: R.L. Rieger, U.S. Navy]

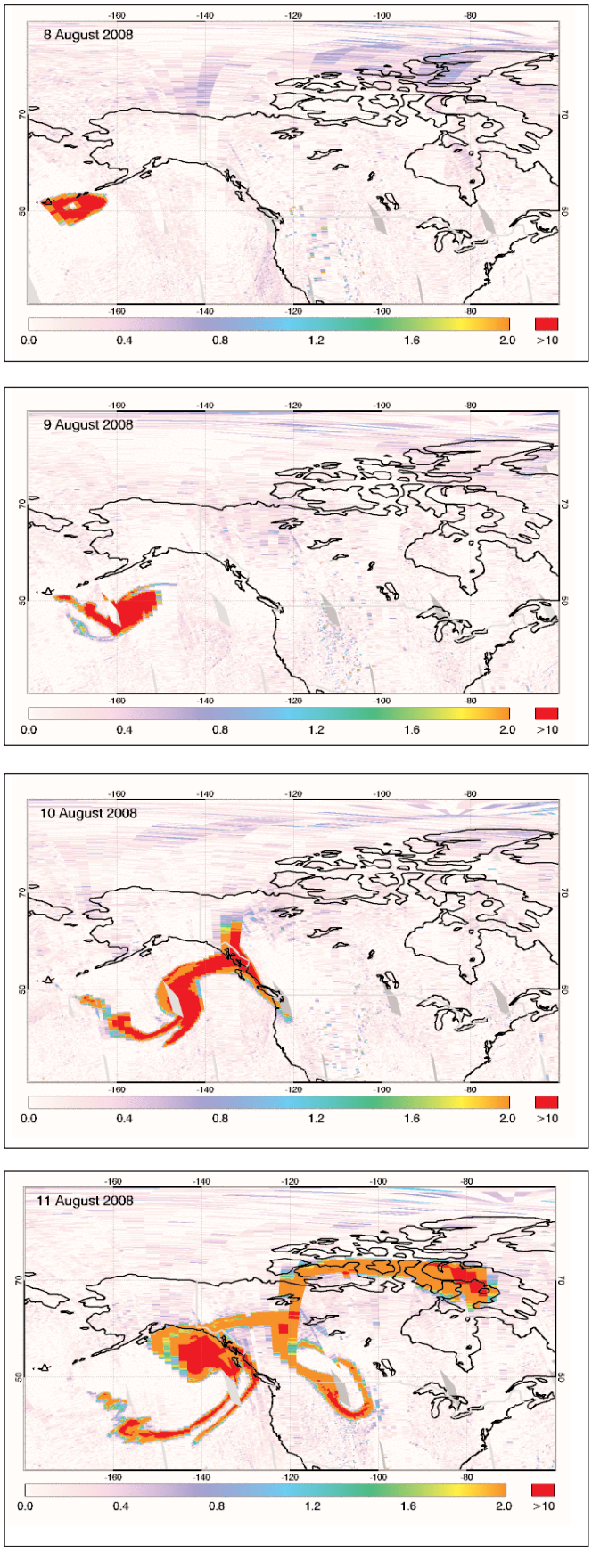
THE VOLCANIC ASH ADVISORY CENTRES

The Volcanic Ash Advisory Centres (VAACs) are the official organisations charged with gathering information on the presence and motion of volcanic clouds. On the basis of this they issue advices and alerts to airline and air traffic control organisations on the possible danger of volcanic clouds. The VAACs are part of a system set up by the International Civil Aviation Organization (ICAO) called the International Airways Volcano Watch (IAVW), which was founded at an ICAO meeting in 1995.

VAAC responsibilities to aviation users include to utilise satellite data, pilot reports, and other sources of information to detect and track ash clouds, and to use trajectory and dispersion models to forecast the motion of ash plumes. Satellite observations of SO_2 can assist the VAACs in their tasks, though SO_2 is not officially part of the VAAC responsibilities: SO_2 measurements can help pinpoint the presence of volcanic ash clouds, in particular during the first few days after an eruption. In general the ash will drop due to gravity effects faster than the SO_2, so that some distance away from the volcano the ash and SO_2 clouds may be separated.

THE SUPPORT TO AVIATION CONTROL SERVICE

With the above considerations in mind, a Support to Aviation Control Service – SACS for short – is being set up. The aim of SACS is to deliver in near-real time (i.e. around 3 hours after observation) measurements of SO_2 concentrations derived from satellite observations. In case of exceptional SO_2 concentrations ("SO_2 events") SACS issues a notification by e-mail to the VAACs and other interested parties, such as volcanological observatories. The core users of SACS are the London and Toulouse VAACs, which cover Europe and Africa, but the data is not restricted to these areas: the service covers SO_2 concentrations world-wide.
SACS currently uses observations from the satellite instruments SCIAMACHY (aboard the EnviSat satellite), OMI (aboard EOS-Aura) (*figure 3*) and GOME-2 (aboard MetOp-A). These instruments are on polar-orbiting satellites at about 800 km and they measure the SO_2 in the Ultraviolet, which means they provide one measurement per day during daylight. To provide additional data, SACS will be extended in the near future to include SO_2 measurements obtained in the Infrared, notably from the IASI instrument (aboard MetOp-A), as these are also available during night-time. In addition, all instruments will be used to give some basic information on the distribution of certain types of aerosols.



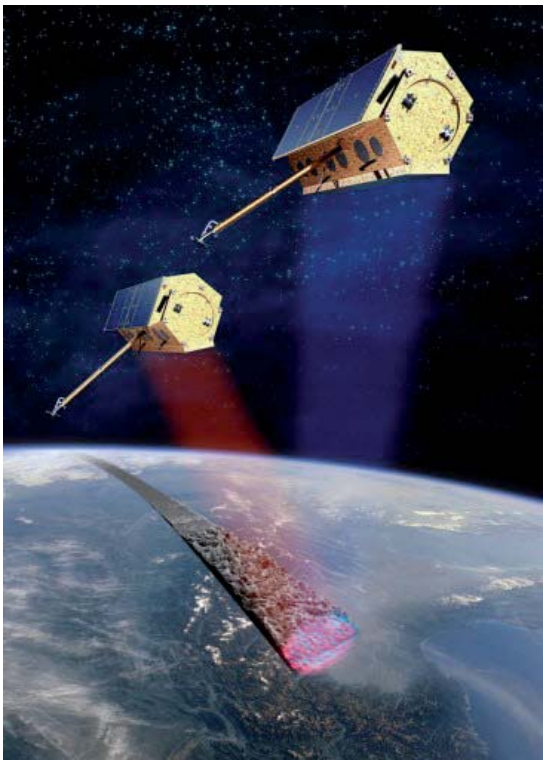
Sulphur dioxide is not only emitted by volcanic eruptions, but also by some anthropogenic activities, such as fossil fuel combustion, oxidation of organic materials in soils, and biomass burning. From the satellite measurements it is at the moment not possible to distinguish the different sources of SO_2. Studies are ungoing to improve this situation, by trying to determine the altitude of the SO_2 cloud from the measurements and from trajectory/disperison modelling.

SACS is primarily set up under the umbrella of the ESA financed project GSE-PROMOTE, combining activities at the Belgian Institute for Space Aeronomy (BIRA-IASB, which acts as service leader), Carlo Gavazzi Space (CSG, Italy), the German Aerospace Center (DLR), and the Royal Netherland Meteorological Institute (KNMI). SACS is financed by ESA to continue beyond PROMOTE and will then include activities at the Free University of Brussels (ULB), and work in close collaboration with the Norwegian Institute for Air Research (NILU).

For more information on SACS, maps of the SO_2 data and alerts of SO_2 events, see http://sacs.aeronomie.be/

Figure 3. The eruption of the Kasatochi volcano, on 7 August 2008, sent a massive amount of SO2 and ash into the atmosphere; more than 40 flights were cancelled by Alaska Airlines because of the ash clouds. Driven by the winds at different altitude, the SO2 travelled to the East along different routes. The maps show the total column amount of SO2 in Dobson Units (DU), based on observations from the OMI instrument from 8 to 11 August; the location of Kasatochi is indicated by a triangle. [Maps: BIRA-IASB / KNMI / NASA]

AFTER TERRASAR-X, TANDEM-X



TanDEM-X, which is five metres long and weighs 1.3 tonnes, has been transported from Friedrichshafen (Astrium) to Ottobrunn in last June to undergo testing at Astrium's and IABG's test facilities. Final checks will be conducted here ahead of launch. It will then be transported to Baikonur space centre –Kazakhstan) with lift-off aboard a Russian Dnepr launcher scheduled for October 2009. (Credit EADS Astrium)

TerraSAR-X, the German radar satellite, has completed two successful years of service since its launch on 15 June 2007.TanDEM-X,its 'sister' will be launched from Baikonur space centre in next October. It will orbit in a close formation with TerraSAR-X, at distances of between a few kilomtres to just 200 metres. So, the two satellites will be able to capture data of unprecedented accuracy. This will ultimately lead to a global digital elevation model of all land masses on the Earth's surface.

TanDEM-X, IN BRIEF

TanDEM-X (TerraSAR-X add-on for Digital Elevation Measurement) is being implemented by a Public-Private Partnership (PPP) between the German Aerospace Centre (DLR) and Astrium GmbH in Friedrichshafen.
The primary goal of this mission is to generate a global digital elevation model. To achieve this, TanDEM-X and TerraSAR-X will form the first configurable Synthetic Aperture radar (SAR) interferometer in space with a separation of a few hundred metres. A powerful ground segment which is closely interfaced with that of TerraSAR-X completes the TanDEM-X system. The satellites will fly in formation and operate in parallel for three years in order to cover the entire surface of the Earth.

DLR is responsible for the scientific exploitation of the TanDEM-X data as well as for planning and implementing the mission, controlling the two satellites and generating the digital elevation model. As with terraSAR-X, the responsibility for marketing the TanDEM-X data commercially lies in the hands of Infoterra GmbH, a subsidiary of Astrium.

From EADS Astrium Press release, June 2009.
www.astrium.net

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The Council of European Aerospace Societies - CEAS -

The CEAS:an International Non-Profit Association
Located: Belgium - Rue du trône 98 - 1050 Brussels
www.ceas.org
The CEAS aims to develop a framework within which the major aerospace societies in Europe can work more closely together. The Member Societies: AAAF (France), AIAE (Spain), AIDAA (Italy), DGLR (Germany), FSAE (Finland), FTF (Sweden), HAES (Greece), NVvL (Netherlands), RAeS (United Kingdom), SVFW (Switzerland),TsAGI (Russia). Following its establishment as a legal entity conferred under Belgium Law,this new organisation began its operations on 1st January 2007.
The basic mission of the Association is to add value at a European level to the wide range of services provided by the constituent Member Societies,allowing for greater dialogue between the latter and the European institutions,industry,governments and academia. The Council is governed by a Board of Trustees,with representatives of each of the Member Societies.

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Among the Main Coming Events • 2009 and 2010

- **1-2 October**: 13th CEAS - ASC - Aeroacoustics Workshop & 4th Scientific Workshop of X-3 Noise -"Resolving uncertainties in airframe noise testing and CAA code validation" - Place of Parliament - Bucharest, Romania
- **5-7 October**: 3AF - Symposium - High Energy Materials, Performances and Civil Applications - Biarritz, France - lisa.gabaldi@aaaf.asso.fr
- **14-16 October**: DGLR - IMAPP Conference - Hamburg.
- **15-16 October**: TsAGI - 4th Workshop EU-Russia Co-operation in Aeronautics Research - Organised by the Ministry for Industry and Trade, and the EC - Moscow, Russia - ved@tsagi.ru - www.tsagi.com
- **26-29 October**: Manchester (UK), CEAS European Air & Space Conference 2009. Please consult regularly the Website www.ceas2009.org in order to keep exactly informed of the evolution of the preparation process.
- **6 November**: RAeS - Aerospace & Aviation Careers Fair
- **18-19 November**: RAeS - Fixed -Wing and Rotary-wing FSTDs - The way ahead - Automn Flight Simulation Conference - London.
- **24 November**: RAeS - Design Methods and Tools for Light Aircraft - General Aviation Conference
- **25 November**: RAeS - Structures & Materials - Half Day Seminar
- **1-3 December**: SESAR Workshop - This workshop is brought under the auspices of SESAR and WP-E. It provides an opportunity for researchers to present their latest innovative ideas related to air traffic management in an open and relaxed environment - EUROCONTROL Experimental Centre, Brétigny-sur-Orge, France - www.sesarju.eu
- **3-4 December**: 3AF - International Conference - Space for Security and Defence in Europe - The aim of this Conference is to focus on the importance agreed upon the European Institutions and the EU Member States regarding their space policy in a security and space context, to debate the governance of such activities, to give an insight into the perspectives of space solutions to the new needs in this domain and also to clarify the implications of European industry in this area.- Paris - lisa.gabaldi@aaaf.asso.fr

2010

- **3-5 February**: 3AF - Optronics - International Conference - anne.venables@aaaf.asso.fr
- **9-12 February**: 3AF- International Conference - Missile Defence, Challenges in Europe - Lisbon, Portugal - lisa.gabaldi@aaaf.asso.fr
- **9-19 February**: FTF - MODPROD International Workshop on Model Based Product Devel opment - Linköping University, Sweden
- **25 February**: RAeS - Weapon System Integrity vs Interoperability - WS&TG Group Conference - Salisbury - www.aerosociety.com/ conference
- **22-24 March**: 3AF - International Symposium - Applied Aerodynamics - Marseille, France - anne.venables@aaaf.asso.fr
- **20-22 April**: RAeS - Aerospace 2010 - RAeS Annual Conference - London - www.aerosociety.com/conference
- **25-26 May**: RAeS - Human Factors Conference - London - www.aerosociety.com/conference
- **9-10 June**: RAeS - Flight Simulation Technology Conference - London - www.aerosociety.com/conference
- **16-17 June**: RAeS - Operating Helicopters Safely in a degraded Visual Environment (day/night and adverse atmospheric conditions) - Rotorcraft Group Conference - London - www.aerosociety.com/conference
- **19-24 September**: ICAS - Hosted by 3AF - ICAS 2010 - 27th Congress of the International Council of the Aeronautical Sciences - Nice, France - www.icas.org
- **18-19 October**: FTF - 7th Swedish Aeronautical Congress "Flygteknik 2010" - bengt.moberg@sas.se

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