INPUT

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Input

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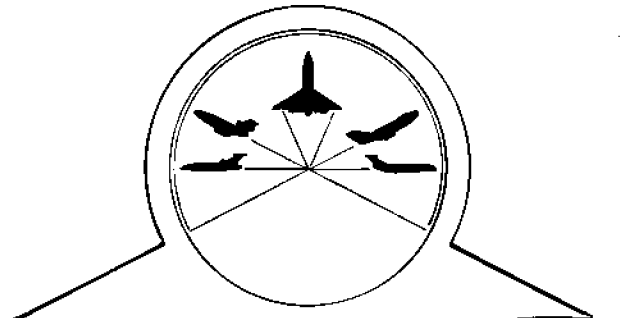
Editorial Staff:
Editor – Mick Lewis
Co-Editor – Ian Guild
Asst. Editor – Paul J. Hooper
Advertising Manager – Fred le Noble
Artwork/Cartoons – Martin Germans



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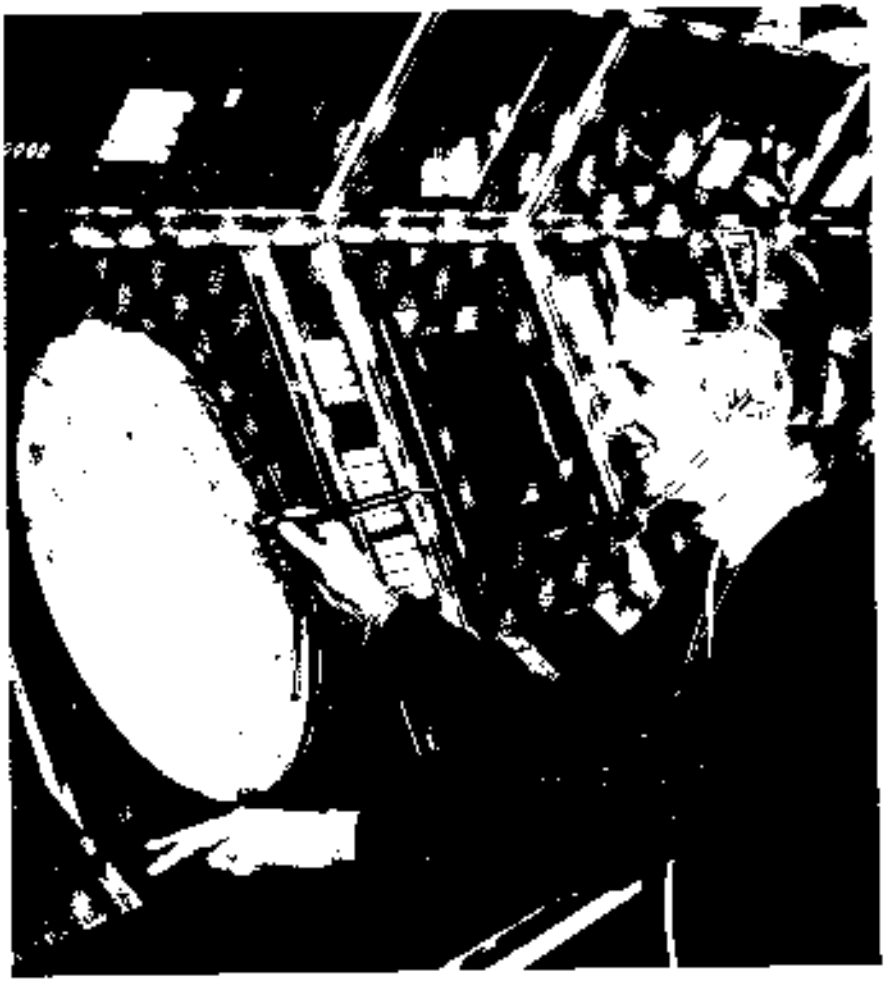

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Output

Stress - An Easy Cure ?

A publication was recently received by EGATS, the implications of which, if they are to be believed, could revolutionise the aviation industry in general, and air traffic control in particular. It claims that there is a simple technique by which problems of stress, boredom, human error etc. can be easily eliminated - seemingly an all - embracing cure for the ailments that beset the ATC profession. The document in question is a report of the ,,International Conference on Aviation" held in Switzerland last October in the Maharishi European Research University (named after its famous founder, Maharishi Mahesh Yogi); the technique is Transcendental Meditation (TM).

The reaction of those reading the report itself, or about it, will probably range from enthusiastic interest to deep cynicism. These are some of the points that were brought up at the conference:

– Transcendental Meditation is a simple, natural mental technique which is practised for twenty minutes morning and evening. Its effect is to expand the consciousness and release stress from the nervous system. It requires no phylosophical or religious belief, but is a mechanical technique producing a settled state of consciousness in the physiology by allowing the mind to settle to a state of least excitation.

– Exponents of TM feel refreshed, very clear in their minds, more friendly, more capable of solving problems and less fatigued.

– Extensive scientific research shows the effects of TM to be caused by physiological changes, such as reduction in metabolism rate, increased coherence in brainwave patterns, and reduction in stress hormones such as plasma cortisol. Hearing becomes more acute, visual perception is improved, problem-solving is more rapid, reaction time faster.

– TM overcomes frustration born of routine: this could have application in pilot training, where teaching, learning and maintaining essential knowledge of drills for emergencies can be repetetive and boring.

– Controllers practising TM would have a greatly increased sense of awareness, and be capable of reacting automatically without stress or error.

– It is suggested that TM should be incorporated in the basic training of controllers, pilots, airline management etc for the future benefit of aviation.

Should this suggestion be taken seriously? Is the ancient method of Transcendental Meditation the answer to modern day problems? Despite statements that there is no mystery or Faith involved, many may be suspicious of the pseudo-religious aura which has become associated with TM - they will not be encouraged to learn that this report was sent by the ,,Ministry of Health and Immortality of the World Government of the Age of Englightenment".

The booklet itself is an extremely lavish product: the conference has overtones of an indoctrination ceremony, presentation being along the lines of a high-powered advertising campaign. The reader of the report is left with the impression that he has not been told the full story and wondering where the finance comes from for such expensive publications, Swiss universities etc. Are there, in fact, commercial interests in popularising TM, which, it is claimed, contributes to the general well-being of society? There can be no doubt, however, that some form of self-regulated deep relaxation to counteract stress can only be beneficial to controllers. Can the claims on behalf of TM be dismissed, or is there a case for investigation by, for example, IFATCA, IFALPA and other aviation authorities?

The purpose of this editorial is not to draw any conclusion, but, hopefully, to promote further comment on the subject from whatever viewpoint. ,,INPUT"s address is on page 1. Copy deadline for next issue is March 2nd.

Mick Lewis

Long sleeps for all ?

EEC night shift threat

A doctor's certificate would be needed by everyone working night shifts under legislation being prepared by EEC officials. They want member governments to ban all-night work in principle, and in practice to permit it only under heavy restrictions.

The CBI is leading Common Market employers in a fight against the proposals, which it says would cripple most of Europe's principal growth industries, such as petrochemicals and paper, which rely on round-the-clock processes.

But the commission's vice-president, Henk Vredeling, who is director of both employment and social affairs, is determined to push through the plan.

The working party which produced it has started by assuming that night work is unhealthy and socially undesirable. They want laws requiring employers to:

- Register all night workers and supply detailed information about their health, age, sex and duties.
- Have all workers medically examined before starting on night work, with regular checks while they are doing it.
- Ensure satisfactory meal and transport facilities.
- Conform to a fixed pattern of shift working, with laid-down minimum breaks between shifts and between spells of night work.

(Sunday Times)

EGATS members visit Suriname

By J. van Eck & A.P. Bonne

On 17th October 1978, we left a cold and rainy Amsterdam, destination Paramaribo. This trip was a result of promises which we made to SATCA (The Suriname Air Traffic Controllers Association) at the Copenhagen Conference, to give assistance with preparations for the 1980 IFATCA Conference. In order to make the handover from one annual conference to the next as easy as possible, we asked Erik Sermijn, President of the Belgian Guild, to join us. Our visit was planned at this particular time because a delegation of members of the Netherlands Parliament (including P. van Zeil) was visiting Suriname as well. This meant that we would be able to make contacts more easily, and to bring IFATCA to the attention of the Surinam Government.
At the warm and sunny Zanderij airport we were welcomed by a delegation of controllers. The next day we were already at our first meeting with the Board of SATCA at ,,Zorg en Hoop", a regional airport at which the ATC school is located.

Airport Zorg en Hoop

We learned that a lot of work had already been done. The first task to be completed is to arrange sponsorships, and to obtain written confirmation of promises. During our stay, two hundred bedrooms were guarenteed for delegates. The financial situation is healthy and at this stage of progress we do not forsee any particular problems.
The transport to/from the conference might give rise to difficulties for some MAs, because of the expense involved; but then we, in Western Europe should perhaps remember that we have not really considered similar problems faced by MAs having to travel great distances to Copenhagen or Brussels. SATCA may have to limit the size of delegations to a maximum number, however, because of accomodation shortages.
We stayed in the hotel Torarica, where, coincidentally, the delegation from the Netherlands was also

Swimming pool, Torarica

accomodated. The chairman of the hotel directors is Mr. E. Wijngaarden, a man who seems to be inexhaustable, and who is always campaigning for his country (,,As a citizen I have the right and the obligation to say what is on my mind!"). He promised to help make the Conference a success. Incidentally, the Torarica has a good bar, a casino, a swimming pool, and the service is excellent.
On Thursday we flew in a Dakota (PZ Love Taking Care) to Paloemeu, close to the border with Brazil, where we made contact with the Indians. It is quite an experience to cross a fall in a small boat!
Mr. van Zeil arrived that night, so we made an appointment for the next morning with the Executive Board of SATCA. At this meeting the anticipated problems were explained and discussed. Mr. van Zeil said that he would do his utmost towards the success of the Conference. That same afternoon - during his first radio interview - he already made mention of the ATC event.
On Saturday we took a journey in an airconditioned car (driver's name ,,Cowboy") to see something of the country. Amongst other things we visited Suralco, Powaka and Blaka Watra.
Owing to an Annual General Meeting of the Belgian Guild, Erik had to go back on Sunday. Before he left, we went with two of our Surinam friends and their families to the ,,Kola-kreek", a small river whose water is very clean, but is the colour of Coca Cola.
Back in the Torarica we had a long discussion with a minister of Suriname, Mr. Rodgers, who was fully briefed about IFATCA, SATCA and the Conference. He echoed the opinion of others when he said that the Conference would be considered a great Suriname event.
Next day we discovered what real rain is. It would become boring to list all the different discussions we had - suffice it to say that that we had more meetings than normal this week.
Wednesday, Mr. P. Wijngaarden, brother of Edgar, was bestowed with the distinction of the ,,Orde van Simon Bolivar", the highest award given in Venezuela.
Thursday we were invited by Mr. E. Wijngaarden to

Nickerie

participate in a building inauguration ceremony in Nickerie (situated in West Suriname). The trip was made in a Nomad 22. Nickerie and its surroundings were very impressive. Before any building can begin, ghosts must be driven away from the site - this was done with fireworks. That evening, the last of our stay, we had a last meeting with the organising committee. We made a recap of what had been done, and what still had to be arranged for the 1980 Conference.
What was our impression of Suriname? Nice country, warm and sometimes wet, very good food, great hospitality and one thing's for sure - we intend to go back to our „switi kondre Shranang".
We would like to thank everybody who made our stay so unforgettable; Mr. E. Wijngaarden, Wilco Adams and all SATCA members. We hope to see you again soon.

One foggy day.....

The morning's weather was bad, with many European airports below minimum due to fog. The visibility in Frankfurt was fluctuating although some aircraft were able to take off. One such Speedbird flight was entering the Maastricht airspace, and the controller enquired about the situation.
LEC: BA 123, what was the weather like when you left EDDF ?
BA 123: Oh, not too bad, about 500 or 600 metres visibility.
LEC: Roger, was there anyboby landing when you took off ?
BA 123: I hope not !!

Landing Cats ?

Europe's airlines fear no fog

November traditionally brought long delays for many air travellers. Most of them were due to fog, the most menacing meteorological hazard to face aircrews. This year, however, the foggy season is causing fewer delays than ever before, with automatic-landing systems guiding passenger-laden airliners into dozens of airports worldwide. The main arena of activity is Europe, although the US is making a belated but significant entry into the scene. For the first time Concorde is likely to land passengers in poor visibility, while experience with the Trident, Caravelle, Mercure, TriStar, DC-10 and A300 is being extended.
British Airways, whose short-haul element probably carried out more early all-weather operations than any other airline, is prepared to operate in Category 3 conditions with Tridents, TriStars and Concordes, and will fly BAC One-Elevens in 300m visibility. In France Air Inter is again offering domestic services with Caravelles, A300s and Mercures carrying Category 3-rated systems and crews. And all-weather rivalry is likely to emerge, for the first time in Europe, with British Airways, Air France, Lufthansa and Swissair all fielding suitably equipped airliners. Delta and perhaps TWA can be expected to appear from the US with Category 3-equipped transatlantic TriStars.
An automatic landing in commercial airline service is still relatively rare, and few aircraft are fully equipped yet. Even if they were, the airport, its instrument landing system (ILS) and the flight crews all must have satisfied stringent requirements before the operation can go ahead. British Airways has done almost all the pioneering airport approval work in the UK and Europe, and believes that other European airlines, especially those based at Continental airports with Category 3 clearance, are now benefiting from its efforts.
Airports which British Airways has cleared for Category 3 operations by its own Trident and TriStar crews are Glasgow, Hannover, Heathrow, Lyons Satolas, Paris Charles de Gaulle and Orly, and Zurich. It is expected that Bordeaux will be cleared any day now, and that Belfast, Edinburgh, Milan Malpensa, Munich and Venice will be checked out in the near future. Often only one runway direction at a particular airport has Category 3 status, but as fog is usually associated with calm conditions, this rarely restricts operations.
Category 2-equipped runways are available throughout Europe, but in many cases it is not a simple job to upgrade an airport and its ILS to Category 3. British Airways cites lack of taxiway centreline lighting as a deficiency which, although not preventing limited, clearance, certainly limits the minimum runway visual range (RVR) to 200m. While crews who have landed in fog, even at their home base, can never be absolutely sure which taxiway exit they are looking at after the ground roll, taxiway lighting

control and surface-movement radar can be a great help. These systems are expensive, however, and airport authorities cannot always justify such a heavy investment.

Standardisation of ground facilities also seems to be a reasonable longterm objective. Some British Airways crews have been confused by different taxiway lighting practices at similarly equipped airports. For instance, both London Heathrow and Paris Charles de Gaulle have taxiway ,,blocks" with green entry lights and red stop lights. But while Heathrow's ground movement controller can switch blocks individually, the Paris system works on sets of blocks. If a pilot has to turn out of a line of green clearance signals at Paris he is expected to know where to do so, and this has confused some crews taxiing towards the runway for Category 3 take-offs.

One unusual low-visibility landing aid which is available at both Paris airports is the Turboclair fog-dispersal system. One runway at each airport has a set of underground-mounted jet engines. The exhaust gases of the dozen or so engines, spaced along one side of the touchdown zone, are expelled through gridded panels to maintain a relatively large volume of air at a temperature above that needed for fog formation. The result is a clear patch of sky around the touchdown zone.

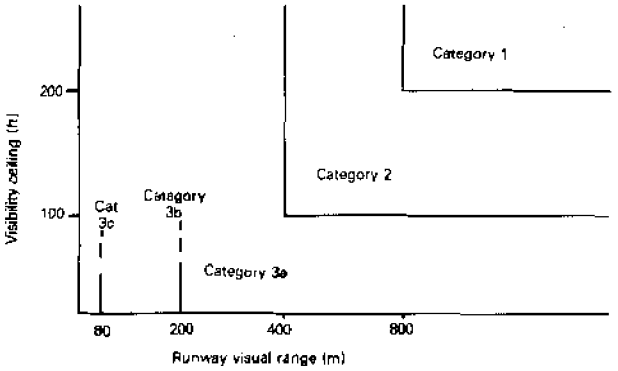
Although the system is regularly used by crews who believe that it reduces the fraying of their nerves, Turboclair cannot be used to obtain a Category 3 clearance on a runway which does not satisfy other requirements. Although Turboclair clears the touchdown area, the aircraft passes into Category 3 visibility during the ground roll. Airlines therefore treat landings on Turboclair-equipped runways as they do other Category 3 operations, but usually do not discourage crews from requesting the fog-dispersal system. Any extra visibility, whatever the cost, is likely to improve safety and might be the final factor in persuading a crew to land when they might have otherwise chosen to divert.

Diversions are as dreaded by operations staff today as much as they ever were, and the cumulative effect of one delay on a well-utilised aircraft can sometimes take several days to remedy. Air Inter, the French domestic carrier, demonstrated the value of automatic landing in December 1976 when, in one day, 23 Category 3 landings were made at three French airports. Sixteen of the airline's Mercures, Caravelles and A300s were involved in this operation, which brought 2,456 passengers to their destinations instead of diversion airfields, and avoided the disruption of 70 more flights. With an average load of over 100 passengers - there were 218 on one of the Air Inter A300s - the cost of automatic landing equipment is relatively low when discounted per passenger.

Large airliners are now having automatic landing systems fitted as a matter of course, and A300s and TriStars in service with competing airlines will play a large part in extending the number of Category 3 operations likely this winter. This trend became evident in the US last year with the first Category 3 landings by two airlines at the same airport on the same day. Four Delta TriStars and one operated by Eastern landed at Atlanta on November 29 last year, the only movements out of 113 scheduled in the 2½hr morning peak. Delta had opened the Category 3 era in the US during the previous winter.

Category 3 system could save enormous amounts of money at some of the American hub airports, but interest has developed more slowly in the US than in Europe. This could be due to the fact that the US put its early all-weather landing efforts into pilot-directed manual flare guidance, only later adopting the fully automatic approach favoured in Europe.

The FAA has approved systems in the Boeing 747 and Lockheed TriStar for Category 3 landings, and last winter had four airports - Atlanta, Denver, San Francisco and Washington - suitable equipped. Eight more Category 3 ILS sets are to be installed, and the FAA has revealed plans to consider limited Category 3 operations at up to 37 airports with Category 2 standard ILS. Some sites will probably prove to have terrain limitations which will prevent the new rules from being applied, and operations at the approved fields will be limited to 210m (700ft) RVR conditions. No airport has received this ,,Category 2-plus" treatment yet, but the first should be approved before next winter.



It has been usual for airliner manufacturers to offer their aircraft with a basic Category 2 capability, plus a Category 3 option, but this could be a thing of the past. British Airways will take delivery of its Boeing 737s with the Category 2-rated Sperry SP-177 system, and has already specified additional equipment capable of failpassive operation into Category 3 conditions. Sundstrand visual approach monitors (VAM) are to be installed in the glareshields of the BA 737s, though the system is not expected to win CAA approval for full Category 3 operations. Landing minima of 200m RVR and a decision height in the 50-60ft region are hoped for, and take-off in 75m RVR is to be sought. The airline's One-Eleven fleet is operating in Category 2, with minima of 300m RVR and 100ft decision height, although the RVR minimum is below that recommended by ICAO. The relatively high decision height is acceptable because the One-Eleven approaches in a very flat attitude. British Airways believes that Category 2 conditions are relatively rare in Europe, and CAA research at RAE Bedford is expec-

ted to confirm that Category 2 weather is a transitory phenomenon.

The benefits of existing Category 2 systems might be extended by adding ,,Economical Category 3" capability. Research and development work on such a device has been undertaken by Smiths Industries and RAE Bedford, though no production decision has been taken.

Another European airline which is entering the Category 3 stakes is Swissair, whose DC-10s are currently cleared for low-minima operations at Zurich only. The airline flew 4,100 clear-weather automatic landings up to February this year to validate its aircraft and system. When the DC-9 Super 80 is added to the Swissair fleet it too will be developed to operate in Category 3. Providing the required fail-passive characteristics will be a dual-channel Sperry system with a Sundstrand head-up display. Swissair should have a predominantly Category 3 fleet in the early 1980s.

Lufthansa started its low-minima programme with the A300 and will extend this with the A310 in the future. A disappointment for the airline is the fact that operations at Frankfurt, its most important base, are limited to Category 2. This should however be remedied if airport reorganisation plans are successfully completed.

Though the Boeing 747 does not appear at present in the European Category 3 list, it is almost certain to be included in the near future. Although it was once thought that long-haul operations, with their relatively infrequent landings, could not warrant the expense of automatic landing equipment, this is no longer the case. Higher utilisations and the huge cost of diverting several hundred passengers at a time are causing British Airways to reconsider its decision to accept Category 2-rated 747s.

The airline did achieve a Category 3 rating for its 747s in 1974 but there were several problems. Lateral dispersion of touchdown points ruled out landings on normal 45m-wide runways, for instance. The difficulties have been largely overcome, however, and the airline might start a development programme with its RB.211-powered 747 fleet, as all these aircraft have the full Category 3 system installed. If this proved successful the remaining fleet would be up-upgraded. Ground-roll control might be essential on the 747, and at least three European airlines are talking to Boeing about the possibility of such a system.

Category 2-standard equipment is now used by most major airlines, and the Civil Aviation Authority has approved 20 foreign companies to operate down to an RVR of 400m at nine UK airports. Before it approves any carrier's low-minima operations, the CAA studies the aircraft, system and crew procedures, and usually requires that the airline has been certificated to similar minima by its own authority.

Delta obtained Category 3 approval for operations at Heathrow last week. Both Delta and TWA have been seeking this approval for 1978 operations, and in doing so have brought to light one interesting difference between FAA and CAA approval procedures. The FAA stipulates an ,,alert height" at which the crew checks that all systems are serviceable, and does not require a minimum visual contact height, defined as the ,,decision height" in UK operations.

Airline landing minima in Europe

	Minimum RVR (metres)	Decision height (ft)
British Airways		
Trident 1, 2 and 3	100	12
TriStar	200	15
Concorde	250	15
Air France		
A300	125	25
Concorde*	200	35
Air Inter**		
Caravelle	150	50
Mercure	?	?
A300	?	?
Delta		
TriStar***	200	50
TWA		
TriStar***	200	undecided
Lufthansa		
A300	300	20
Swissair		
DC-10****	200	15

* Paris only. ** French airports only. *** Heathrow only. **** Zurich only.

The approval agreed with Delta has set the decision height at 50ft, the same as the FAA alert height, and a similar clearance would seem likely for TWA.

Although the International Civil Aviation Organisation publishes standard definitions for Category 1, 2 and 3 weather minima, there have been instances of these minima being reduced in some approvals. It seems that Category 1 will be approved down to 600m horizontal visibility and Category 2 to 300m by most authorities in the near future. But the experience in recent years has put paid to the prospects of ever seeing a Category 3c system, once the ultimate objective of the UK Trident programme. It has become clear that although the system integrity objectives could be achieved, the cost would be prohibite in view of the few times that zero-zero visibility is encountered.

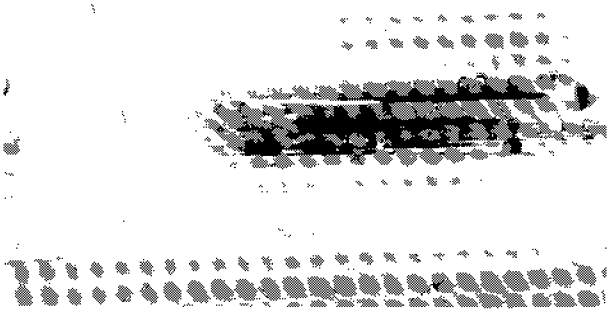
Automatic landing has matured from a novelty into a genuine time, cost and energy-saving asset that no airline can afford to be without. This winter could be a watershed in autolanding history if every airline which has invested in such equipment finally achieves tangible benefits.

Less than 10 years ago, British Airways' chief engineer had to work hard to convince audiences that there were any benefits at all in automatic landings. At that time it seemed improbable that so many airlines would want to join in the act, producing a competitive stimulus. This has happened and, combined with the advantages of smaller and cheaper electronics and larger aircraft, has made the specification of automatic landing systems for all new airliner projects virtually inevitable.

The Hoop's Column.

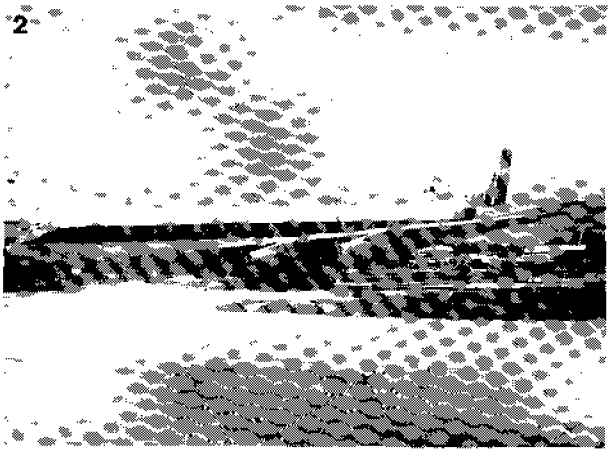
As my previous article concerning piston engined aircraft in Florida seems to have been quite favourably received I hope you wont mind too much if I continue in the same vein for this issue.

1



1. Not only piston engined types are to be found languishing at Miami. There are a number of turbine powered aircraft residing in varying states of health. N301AS is a former Western Airlines Boeing 720 having been delivered to that company back in 1962. As you can see this particular model has pure jet powerplants - what remains of them that is! I must say that one does have great difficulty in determining the status of aircraft in Miami's ,,corrosion corner'', what looks dead today could well be airborne again tomorrow!

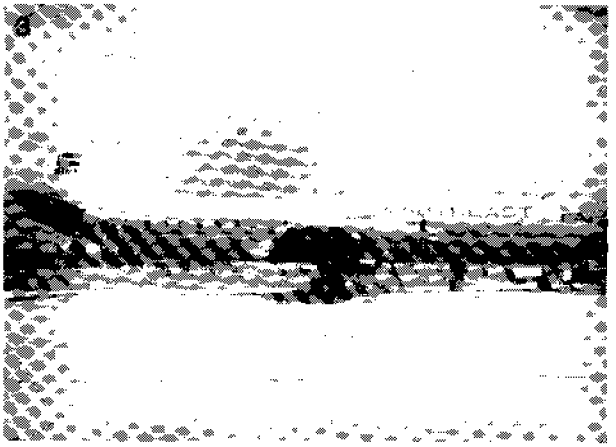
2



2. Also present at Miami on April 20 was this ex-Alitalia DC 8-43, its' former operator's colour scheme still clearly in evidence. The aircraft wears a Colombian delivery registration.

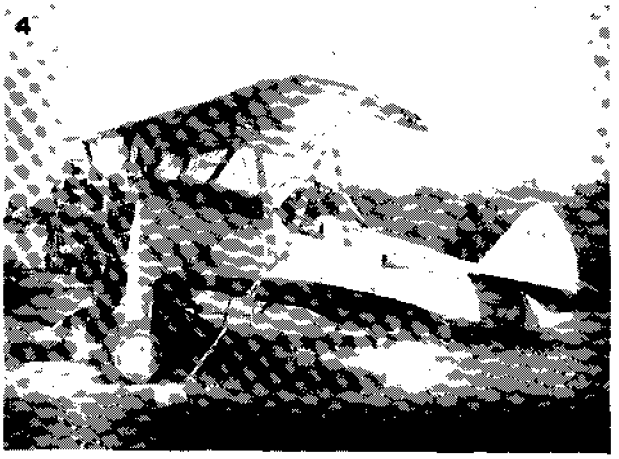
3. The Lockheed Electra remains a highly sought after aircraft, especially for the cargo rôle. The passenger configured aircraft depicted here is owned

3



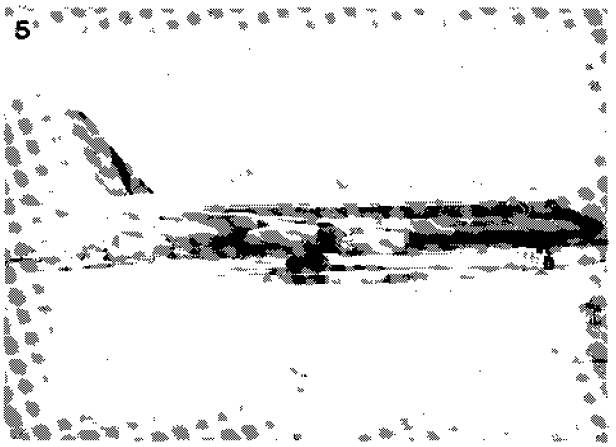
by Miami based MCA Leasing and was being operated by subsidiary company Southeast Airlines at the time. Until quite recently N423MA was operating on the scheduled routes of Air Florida.

4

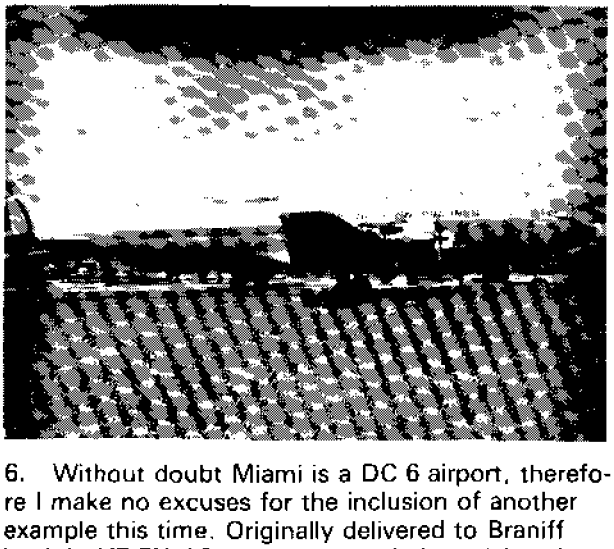


4. South of Miami, not far from Florida City, I came across a crop dusting outfit based in a field right beside the road. N1203M was one of four Stearmans present.

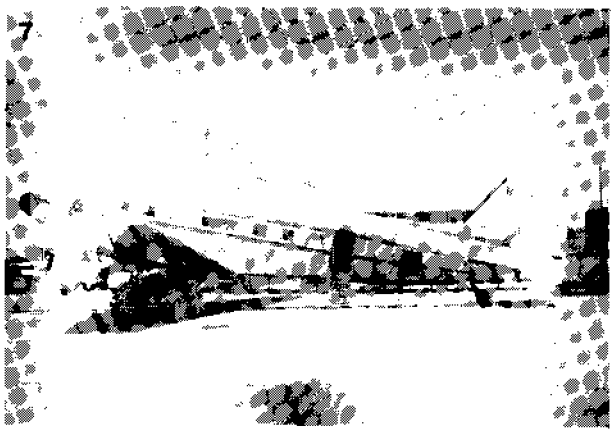
5



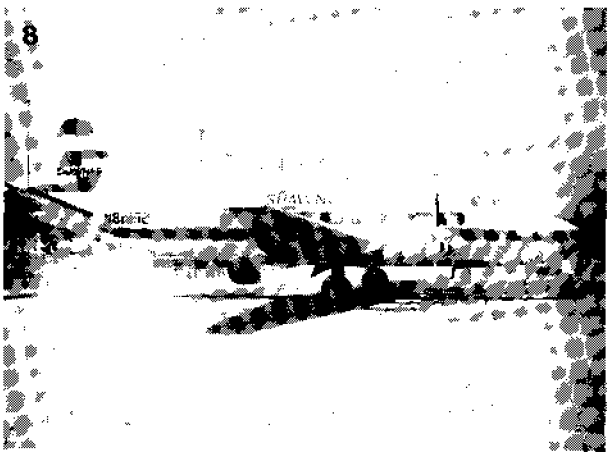
5. A number of Convair 880s are to be found at Miami including this one, N8813E. Unfortunately the bird in the foreground has so far defied recognition!



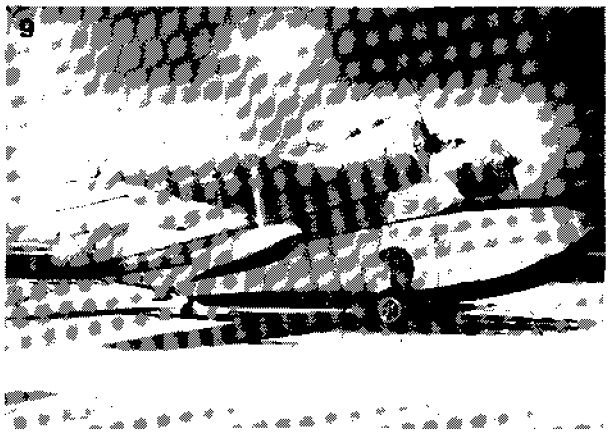
6. Without doubt Miami is a DC 6 airport, therefore I make no excuses for the inclusion of another example this time. Originally delivered to Braniff back in '47 5N-APK has apparently been lying dormant here for some considerable time.



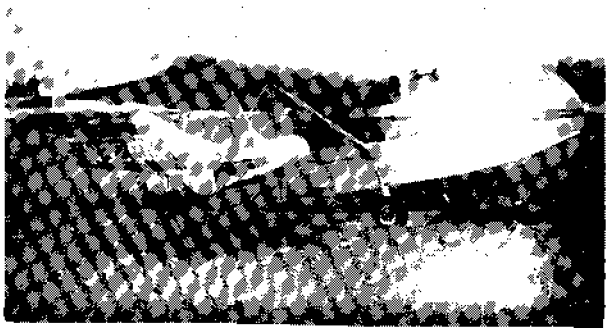
7. And who needs an excuse for showing a DC3 ? Still in pristine condition, N76LP spent its military career with the designation C49J. Panoramic windows bear evidence of this aircraft's conversion to executive configuration. Would you believe that there are still approximately 640 DC3s currently on the U.S. Register! Figure how many there must still be worldwide!



8. Another type which never ages is the Heron. It more than admirably stands up to comparison with equivalent types 30 years its' junior. The machine shown here, N81962, started life in 1954 and during the latter sixties was converted to a Riley Heron by replacing the Gipsy Queen engines with Lycomings.



9. Amphibians, such as this Grumman Goose, figure quite prominently on the Florida aviation scene. N1019N was photographed at New Tamiami.



10. Continuing the theme is this Republic Seabee seen here on terra firma at Opa Locka.

I sincerely trust that I haven't been blowing my own trumpet too much in showing my own photos all the time as the intention has been to show that Florida does host a considerable number of interesting aircraft types. Indeed, should you also have photos which you think may be of interest to Input readers then by all means pass them on to me and we'll try and arrange to print them. They would of course be returned in the condition in which they were received.

I hope in the next issue to tell you something about the types of aircraft which frequented Beek in the early sixties. Should anyone have photos taken at Beek during the sixties perhaps they would contact me with a view to illustrating the article.

P.J. H.

(All photos Paul J. Hooper)

18th Annual Conference

of the International Federation of Air Traffic Controllers' Associations Brussels, Belgium, 22-27 April 1979

GENERAL INFORMATION

Location: Sheraton Hotel
Official Language: English
Registration Fee: BF 2,500.–
Ladies Programme: A Ladies Programme giving general impressions of Brussels and the host country will be arranged.
Travel: Negotiations are in progress with the National Air Carrier for special air fare reductions. Further details will be supplied later.
Secretariat: IFATCA '79 BRUSSELS
Organizing Committee
Belgian Guild of Air Traffic Controllers
Brussels National Airport
B - 1930 ZAVENTEM
Belgium

PROVISIONAL TIMETABLE

Sunday 22 April 1979
1300 - 2000 Registration

Monday 23 April 1979
0900 - 1300 Registration
1600 - 1800 Opening Ceremony
1800 Opening Technical Exhibition
1930 Social Function

Tuesday 24 April 1979
0900 - 1200 Working Sessions
1200 - 1330 Lunch
1330 - 1500 Working Sessions
1530 - 1830 Technical Panel
2030 Social Function

Wednesday 25 April 1979
0900 - 1200 Working Sessions
1200 - 1330 Lunch
1330 - 1700 Working Sessions
1800 Social Function

Thursday 26 April 1979
0900 - 1200 Working Sessions
1200 - 1330 Lunch
1330 - 1900 Working Sessions
Evening at leisure

Friday 27 April 1979
0900 - 1300 Working Sessions
1300 - 1430 Lunch
1500 - 1700 Final Plenary Closing Session
1800 Departure to Leuven for Farewell Party

Make BRUSSELS your rendez-vous for 1979 !

Convex '78 - Some Reflections

On 26/27th October 1978, Jurgen Praeder as speaker and G.A. Wigglesworth as observer attended the UK Guild organised Convex 78. This Convex 78 was a symposium on ,,Civil-Military Coordination" under the heading of ,,The Divided Sky".
Papers were presented by representatives of the various airspace ,,users", both military and civil, and by those agencies which control those users, ie, ATC and Air defence authorities. Jurgen Praeder presented an EGATS paper under the title of ,,Civil-Military Coordination at a Eurocontrol Centre".
I shall not try to summarize all these papers but merely draw your attention to the fact that a copy of all papers presented has been made available to the Guild Technical Committee.
To summarise the Convex as a whole - the majority of papers were naturally concerned with UK airspace and most speakers, both formal and from the floor, gave the impression that UK airspace presented problems which were unique within Europe. This attitude was incomprehensible in that it revealed a lack of knowledge of the problems of airspace usage and control beyond the UK boundaries. Indeed, any problems to be found in UK are also present within the airspace of continental Europe. The problems there are, perhaps, more acute due to the fragmented airspace of the various nations in a relatively small piece of real estate with the associated difficulty of coordinating their usage with a multiplicity of users, all having their own way of doing things. Generally the comments of those speakers who are, to any extent, responsible for the management of UK and European airspace was disappointing. It appeared that whereas the airspace users were far from satisfied with the airspace management, those people responsible gave an air of complacency which seemed to say - We know the problems; we are doing a grand job; all will be well !
To quote but one example - from the paper ,,Airspace sharing in NATO Europe" - the speaker refers to CEAC, the Committee for European Airspace Coordination within NATO.
This committee meets in plenary session TWICE a year. It has, however, two permanent Working groups; i.a Technical group to ensure compatability of civil/military telecommunication equipment.
ii.an Operational group which attends to developing the details of the annual NATO exercise programme, adjusting and coordinating the military requirement to civil needs.
There are those of us at the sharp end of the ATC business who wonder whether it is necessary to plan an exercise area approximately 100 miles long and 20 miles wide which conveniently blocks 5 airways and 2 crossing points, in the height of summer traffic.
There are, no doubt, also some pilots who wonder why they cannot fly above FL290 eastbound from UK to points east until they have passed Munich, or similarly on their flight from Tenerife to Helsinki are required to start their initial descent somewhere in the region of Paris.
Perhaps it could be worse because, quote ,,By and large, CEAC works very well and is making a considerable contribution to ,,the better understanding of airspace management issues within NATO Europe".
We all recognise that our military users must have sufficient airspace for their exercises, daily as well as annual. Equally we know that all other traffic should be allowed optimum routes and levels.
We know that OAT and GAT are not compatible unless both are receiving a fully coordinated air traffic control service.
With these three points in mind one wonders why NATO on the one hand as spokesman for the military and, perhaps, Eurocontrol for the civil side on the other, couldn't really get together and do what the title of this committee suggests - ,,Coordinate European Airspace".
Generally then, a disappointing Convex. Little if anything was said that gave hope for the immediate future. As Mr. Gillet, attending Convex privately, said from the floor, ,,The problem seemed to be 'divided people' not so much a 'divided sky'." People, who for whatever reason were not prepared to allow a solution to be found.
It remains only to congratulate the Anglia lodge of GATCO on the superb arrangements for this Convex. From the domestic and social side the Convex could not have been bettered.

G.A. Wigglesworth

The shape of things to come

During 1978, international air transport entered a phase of unprecendented expansion of a magnitude not anticipated by the aeronautical world and certainly not within the spheres of A.T.C.
European air traffic is affected at the same time by four important factors:
1. The reduction of air fares due to the new IATA structure as well as the ,,Deregulation" by the Carter administration and the C.A.B., and the new bilateral agreements between the USA and several European countries (U.K., FRG, Belgium, Netherlands,....) which all resulted in a greater liberalisation of traffic rights and reduction of air fares; as a result many airlines have already committed themselves to substantial fleet expansion programmes.
2. The accelerated development of cargo transport with several new all-cargo airlines (two in the U.K.)

and increased capacity within others (e.g. the Flying Tiger line saw its domestic cargo traffic increase by 90% between 1977 and 1978!).
3. The continuing expansion in tourism and inclusive tours (several new I/T charter operators in Europe and more to come).
4. The considerable development of Bizjet sales in Europe together with the introduction of many ,,High-flying" turboprops.

When all these factors are considered, one concludes that the European UIR will see a substantial increase in aircraft movements in the coming years (This summer the USA recorded an increase of more than 20% !).
All this is very encouraging for the future of commercial aviation and it is a contributing factor for world economical progress; however a fundamental detail seems to have been ommitted, and that is the saturation of airspace within the present ATC concept.
As it was already quite chaotic last summer at numerous European airports as well as in the airspace, it is going to be even worse next summer with the anticipated traffic figures; some ACC's may be on ,,go slow" actions, some on total strike, some will work on heavy unrealistic restrictions, others on different incompatible types of restrictions and some will be so overloaded with traffic that dangerous situations might arise which could lead to a catastrophe.
Such a situation would certainly be detrimental to the development of commercial aviation and could blemish the attractive looking prospects that the future holds for the airlines.
It is the responsibility of ATC authorities and airline companies to take efficient measures in due time in order to prevent such a situation taking place; in any case, the aviation community must realise the increasing importance of air traffic controllers and use their knowledge and competence to participate in a strategy of a European total traffic management, together with military ATC, airlines and international aviation organisations such as IATA, IACA, ICAO, IFALPA, EUROPILOTE,....
Our profession is in constant evolution, even mutation, but is generally defined within static structures, and it can be observed that after a while the gap becomes too large and creates conflicts detrimental to the whole system.
If we compare the year 1970 with today, we observe that air traffic has doubled in our area, the heavy jets which just started to fly at that time are now accounting for an important percentage of total traffic, the number of jet aircraft has considerably increased and now in addition we see many bizjets and high-flying slow-moving turboprops.
The result is that today's controller does a job different than the one of 1970 in that, although better equipped (sometimes), his responsibilities have increased considerably; for example it is not unknown for a controller, at any given moment, to handle anything up to 25 aircraft in his sector; this could well represent a total of 4000 human lives!

It is time for us to demonstrate that beyond exercising our profession we are capable of not only improving our own system but also participating in the overall amelioration of the air traffic structure in order to maintain a high degree of safety and to increase the efficiency of traffic flow to prevent airspace saturation, this eventually helping the airlines to develop harmoneously.
Being in the heart of European airspace in one of the world's busiest regions, as members of an international organisation having a leading position in ATC, and having created one of world's most advanced ACC with proven efficiency and reliability, we should take the initiative of using the opportunities at our disposal to provide the aviation community with useful and constructive material.
This is where EGATS could play an important rôle. It has already established many contacts in aviation circles through IFATCA and other organisations; but efforts should be made to increase these contacts. By further cooperation with experts in all fields, via its technical/operational committee and other means, EGATS could collect and collate ideas from its 150 members. This could act as a basis for a valuable contribution in solving today's many air traffic problems.

Patrice Behier
Chairman Technical/Operational Committee

For the attention of all Maastricht UAC personell

Eurocontrol Guild of Air Traffic Services

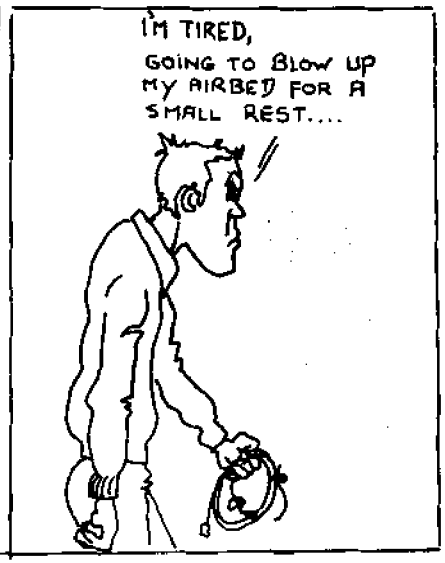
I have recently completed a short visit to the Dutch, Belgian and Eurocontrol guilds of ATS. All three associations are among the backbone associations of IFATCA. The EGATS even within this group is playing a vital part in the work of the Western European Region and in IFATCA as a whole.
There is reason to be impressed by the work laid down by some key members of the guild.
However, in order to continue their good work they need your support. You can give your support first and foremost by joining the guild. Then you may find yourself able to lend a hand in the activities that are the responsibility of EGATS.
It will be a much appreciated hand.

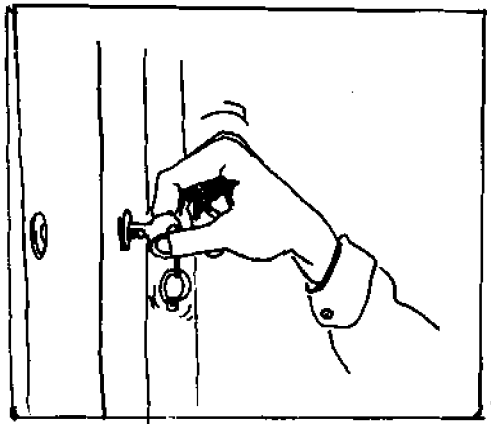
Best regards,

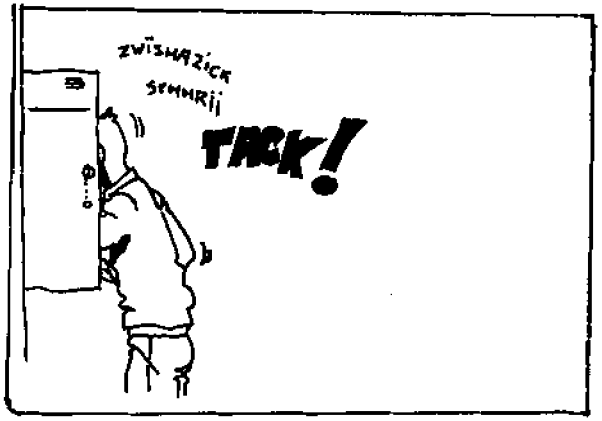
Bjarne Nilssen
Regional councillor Western Europe
IFATCA

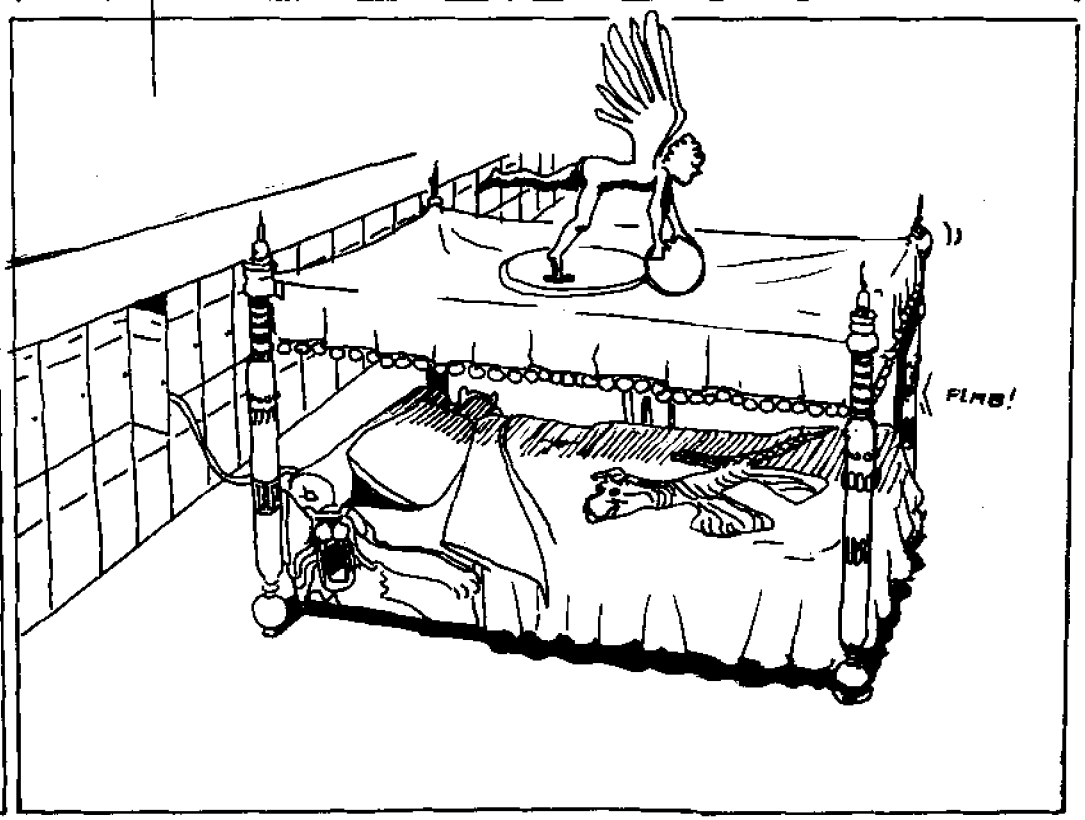
ROGER WILCO

"NIGHT DUTY"









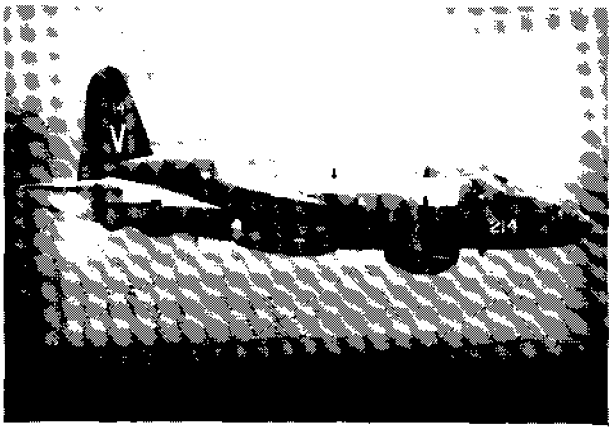
Nulli Secundus

Two Latin words which stand for one of the two squadrons based at NAS Valkenburg (EHVB) near Leiden. „Nulli Secundus", is the device of 321 Squadron which, together with 320 Squadron, forms the core of the Netherlands Search and Rescue Organisation (SAR).

How did it all start?

With the increase of civil as well as military aviation after World War 1 it became necessary to set up international laws in this respect. The initiative to reach this goal was taken at the Aviation Convention of 1919 in Paris, which was followed by the Pan American Convention on Air Navigation of 1928 in Havanna. These two conventions resulted in the 1944 Chicago Convention which in its turn was the start of ICAO after the Chicago Treaty of 7-12-1947. This treaty was initially signed by 52 countries. The Netherlands signed in 1947.
In respect of SAR article 25 of the Chicago Treaty is very specific.
Art. 25:
Each member state commits itself to take such measures to assist aircraft in distress over its territory in so far as is considered practicable and to allow, under supervision of its own authorities, the owners of the aircraft or the authorities of the state in which the aircraft is registered to assist in such a way as is deemed necessary by the circumstances. Each member state shall execute the search for missing aircraft in a well ordered co-operation according to measures which, from time to time, will be recommended in accordance with this treaty.

In compliance with this article the Netherlands SAR-organisation was founded on 24 May 1951. On 30 January 1958 the Netherlands and W-Germany conclude a treaty which settles the co-operation in respect of saving human lifes in the North Sea region.
In 1970 a change was published and from then on the SAR-organisation has occupied itself with the following:
1. Assisting aircraft in emergency over Dutch soil or seas. In practice this means the Dutch FIR.
2. Netherlands – W-Germany co-operation in respect of saving human lives in the Netherlands – W-German area between 06E and 07E.
3. SAR, as an organisation, is furthermore available to fulfil other tasks such as to assist in case of shipping accidents, organ transports, searching for missing persons, which could be anything from looking for a little girl who got lost in the dunes to some idiot floating at sea on a rubber mattress.
In Holland SAR has been delegated to the Royal Netherlands Navy, and as such falls under the jurisdiction of the Commander of Naval Forces. The Rescue Coordination Centre (RCC), located at EHVB, falls under the jurisdiction of the Commander of the Naval Air Base Valkenburg.
In respect of aviation accidents the Commander of Valkenburg has direct executive power. In any other case prior permission has to be obtained from the Commander of Netherlands Naval Forces, although in practice this is only a formality.
At EHVB the RCC is manned on a 24hr basis. Day and night two SAR aircraft, one spare, a Brequet Atlantic SP 13A of 321 Squadron or a Lockheed Neptune SP-2H of 320 Squadron, are on standby, whilst at the Naval Air Base De Kooy (EHKD), a Lynx UH-14A, is ready for „take-off".



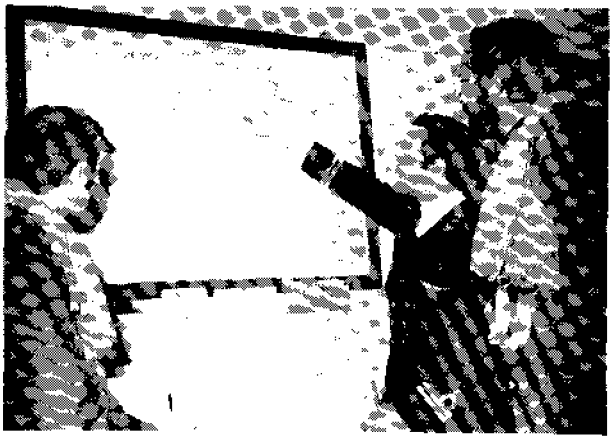
In case of scramble it takes about 15-20 minutes to get SAR airborne; this is in the case that the standby crew is in bed at the time of the alarm. During daytime this is approximately 10-15 minutes. Whenever a SAR-operation is executed the primary task of this unit is to locate the aircraft, ship or person in distress. The secondary task is to rescue and to transport the wounded and/or survivors.
SAR-operations are carried out in close co-operation with:

1. The shipping radio centre, Scheveningen Radio.
2. Coastal stations, including foreign stations, for DF.
3. EHAM ATCC.
4. Dutch Mil ATCC.
5. Ships and aircraft monitoring the emergency frequencies.
6. Adjacent RCC's.
7. Royal Netherlands Airforce-SAR at the shooting range Vliehors.
8. Royal Navy vessels.
9. Dutch National Life Boat Societies (KZHMRS, KNZHRM).
10. Occasionally KLM North Sea Helicopters.
11. Any other civil or military unit, e.g. police, coast guard, pilotage.

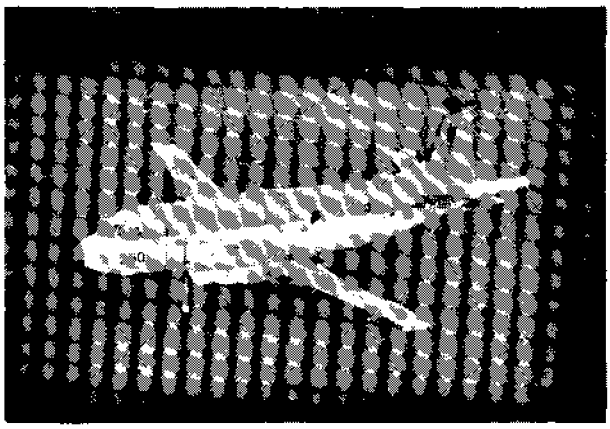
Any report which reaches the RCC either directly from an observer or via one of the above mentioned channels is taken seriously.

Now, what happens when an accident report comes in ?

When an accident report comes in, the whole base is immediately alerted. ATC, fire brigade, etc, are all ready for action whilst a small bus races around to pick up the flight crew of the standby aircraft and takes half of the crew to the briefing room. Here



they receive essentials about the approximate location of the accident, the nature of the accident and as usual information about the prevailing weather conditions in the area where the search is to take place. The other half of the flight crew is taken directly to the aircraft and prepares it for take off. Meanwhile all units are alerted, including, life-boats units closest to the place of the accident, merchant men within a radius of 50NM of the estimated place of the accident, Navy Vessels, and at the helicopter base at EHDK a helicopter crew awaits instructions. At a height of between 100ft - 500ft and at a speed of 165kts the Atlantic starts its search for, let us say, the fighter pilot who has crashed. On board the aircraft we find two pilots and among others two observers, one of whom is seated in the perspex nose of the aircraft. The other one is seated aft the aircraft in front of a window which bulges outward, at the port or starboard side. Each of the two observers is equipped with binoculars to visually search the sea below them. When they spot anything which might be worth a second look they simply press a button which is attached to their binoculars which indicates a position on the plot-table in the main cabin of the aircraft. Here the team-leader of the search-team decides to mark the observed spot with a sono buoy. He selects a buoy on his panel and from a rotating drum in the aircraft's belly this buoy is dropped into the sea. Automatically a homing signal on this buoy is started. It is now possible for the team-leader to take over the control of the aircraft by means of a small joy-stick which is available at the plot-table. Of course, he cannot change the altitude of the aircraft but only the heading. When the victim is found it is possible to drop a sono buoy containing a microphone which enables the victim to speak to the crew of the aircraft.



Now the helicopter unit is advised where to pick up this unhappy, or should we call him happy, fellow from the sea. For this purpose the crew of the helicopters consist of two pilots, one hoist operator, one scuba-diver, if required one doctor, with an extensive first-aid kit.

First of all the diver is lowered into the sea. He attaches the victim to the hoist and together they are brought up to the helicopter. It is then standard procedure to take the victim to the nearest hospital for a medical check. The above described procedure can, of course, not be used when taking sailors off a stranded vessel because one helicopter could not hold them all. In this case either more helicopters are used or the victims are placed in one of the life-boats which have already been directed to the exact location.

When a search is started the search area is claimed by the RCC Valkenburg with EHAM ATCC and Dutch Mil ATCC and no aircraft is then allowed to enter this area which normally extends from MSL to 1000 or 2000ft in altitude and approximately 10NM radius around the estimated position of the object. One of the incidents in which this unit played an important role in bringing it to a happy ending was that of a merchant man which got into trouble un-

der the Dutch coast during a force 10 gale. The deck cargo had started to slide and there was a great danger of keeling over. The ship was listing at a dangerous angle and the only way to save it was to get rid of the deck cargo. Of course, this could not be done from aboard the ship, as the man who was going to cut the lashings would certainly go overboard with the cargo. It was then decided to suspend one of the Navy divers from a helicopter-hoist to do the job. The result was effective, the cargo went but the ship was saved.
Of course, this is a spectacular chapter in the history of this fantastic organisation. Less spectacular, but just as important is the transportation of a severely burnt person, from anywhere in the country, to the special hospital in Beverwijk, and the rescuing of the previously mentioned idiot who thinks that on a summer day anybody can play ship's captain on the North Sea.
But, whatever the situation, the 321 Squadron of the Royal Netherlands Navy, in conjunction with the 320 Squadron, tries to keep up the motto, „Nulli Secundus", - Never Second.

F.J. le Noble,
with thanks to,
H. van Maren
Major Royal Neth Marine Corps
N. Verhulst
Lt. Royal Neth Navy
J. Dijkstra
CPO Royal Neth Navy

The INPUT film guide

The good, the bad and the ugly: gripping drama of life and the unsavoury struggles in the corridor of power. (Not recommended for the squeamish)

Grease: continuing saga of an honest but harrassed canteen operators battle against good food

Saturday night fever: drama documentary which investigates the mysterious disease which strikes control staff due to work weekends. (Not for the cynical)

Death on the Maas: Who will be the next victim of a knife in the back? Good old fashioned entertainment with the Ops Room Goodies versus the Bel Etage Baddies. (Not for those of nervous disposition)

Battle of the Bulge
One moral, upright, supervisors stand against corruption and maiming of decent team members by their grasping and unscrupulous colleagues.

You only live twice: If this is living, once is enough thank you! (Recommended for masochists)

Un homme et une femme: Concerns sensitive and delicate handling of relationships between opposite sexes. (This film should be obligatory viewing for all staff members)

Racal Merger

A new operating company, Racal Acoustics Limited, has been formed from the merger of S.G. Brown Communications Limited and Racal-Amplivox Limited, both long established and highly successful Racal companies supplying audio accessories to the communications industry in civil and defence world markets.
Production will continue at the Watford and Wembley factories of S.G. Brown Communications and Racal-Amplivox, but all future business operations and overall control of the new company, Racal Acoustics Limited, will be centralised at the headquarters in Beresford Avenue, Wembley.
The extensive range of electro-acoustic communications products available from Racal Acoustics covers the diverse radio telephony requirements of both civil and defence equipment markets. The company supplies helmets, headsets and microphones for use on land, sea and air.
Mr. Jim Diggins, chairman of Racal Acoustics Limited, commented „The merger of these two very successful specialist Racal companies under one management will enable the Racal Group to maximise its efforts in world markets where it has already made a major impact for electro-acoustic and avionic communications products.
The combined expertise and resources of the development teams will provide us with the capability to extend our activities into many new areas, particularly in the development of a new generation of ruggedized field telephone equipment and systems using the latest microelectronic technology."

TMAC

John Begg, Transmeridian's genial general manager, describes how Transmeridian Air Cargo Ltd. came to be at Maastricht.

Towards the latter part of 1974 Transmeridian Air Cargo was faced with quite a dilemma. The British airline was enjoying a joint venture with Austrian Air Transport, the cargo charter subsidiary of Austrian Airlines, whereby AAT operated one DC8-63f rotation per week Amsterdam - Hong Kong - Amsterdam with the cargo capacity of the aircraft sold and controlled by Transmeridian from its Stansted base. AAT then unexpectedly announced that for a variety of reasons the entire operation would cease at the end of 1974 and TMAC was faced with having to reintroduce the CL44 propjet freighter to the Far East.

The reintroduction of the reliable CL44 on this route in itself presented no great hurdle, the dilemma facing the Company was from which Continental airport to maintain the Hong Kong service. Several problems had been encountered at Amsterdam's Schiphol Airport mainly due to the high incidence of scheduled traffic and the low priority given to cargo charter operators. It was therefore decided to seek an alternative European base.

The obvious alternative to Amsterdam was Rotterdam but the runway length imposed too many payload restrictions and the airport was discounted. Ostend offered excellent facilities in every area and the prospect of the longer runway coping with unrestricted DC8 and, in the longterm DC10, performance was indeed a temptation but had to be dropped because of the distance of the airport from the commercial centres.

Liege, Brussels and even Eindhoven were given the ,,once-over'' and dropped for their applicable reasons.

In the meantime note had been taken of Maastricht Airport and that airport's cargo experience with the defunct Lloyd International Airways. The runway permitted CL44 operations without payload penalty in either direction and the physical position of the airport in Europe meant connections with the cargo centres of Europe within a few trucking hours. The economics of operating from Beek Airport were highly attractive and to a charter operator had the obvious magnetic effect. So it transpired after due consideration, much discussion, mutual visits and notwithstanding a few beers, the decision was made to establish an office at Maastricht and to commence flying operations. On December 01 1974 Transmeridian Air Cargo established their presence on the airport and despite many comments and remarks from the cargo industry pessimists that ,,It'll never work'', has not looked back since.

In the first full year of operations - 1975 - TMAC enjoyed a throughput of 3.2 million kilogrammes increasing to 4.6 million kilos in 1976, holding steady in 1977 in spite of fierce competition and 1978 will show another very healthy upsurge. From the original staff of one, your author, the fulltime Maastricht personnel of TAC, as the Company is now abbreviated, has risen in three years to eight. Two DC8 freighters have been added to the fleet of 6 CL44 aircraft and the ubiquitous CL44 Skymonster and the total number of personnel is not far short of 600.

Today Transmeridian occupies comfortable office accomodation where sales, operations, accounts and the many facets of the Maastricht operation are controlled under one roof. The aircraft, carrying TAC's new colours, are to be seen virtually daily at Beek uplifting a variety of goods for the principal destinations of Muscat, Hong Kong, Sydney, Melbourne and Lagos or offloading the many consumer goods from Hong Kong or Asmara or Colombo.

The original policy of cautious expansion has paid off handsomely for Transmeridian at Maastricht and there would be little argument that the CL44 and DC8 aircraft are as familiar a scene at Beek as the Fokker Frienships of that other reliable operator, NLM Cityhopper.

Thoughts of a West Executive Controller

Here we sit hunched in a little line
With faces of deathly hue
Is that near airmiss his or mine?
I really wish I knew
Now I don't have radar strips
And the traffic is getting worse
There's lots and lots of little blips
And my assistant can only curse,
He's banging the desk and shouting again
That handover was made too late
For the hundredth time I think in vain
Why was I so keen to validate
I should have stayed a calm PC,
Avoided all this stress
Still, another five minutes then I'll be free
Someone else can have this mess
That one at Nicky climbing too fast
And this coming from Cambrai
Oh, there's the one that London passed
Too late, but that's their way
I think it's time that I unplug
It's getting much too fraught
Thank God, here comes another mug
Let him write the airmiss report.

IACA forms EURACA

The International Air Carrier Association (IACA) held its International Policy Board meeting on 5/6 October 1978 in Seattle, Washington.
The IACA Board reviewed developments in the world air transportation system with specific focus on new bilaterals being considered between the U.S., Germany, Holland and other countries, as well as the regulatory reform progress being made in the U.S. and the legislation under consideration by the Congress.
At this meeting the International Policy Board established a European Air Carrier Assembly (EURACA), which will be comprised of the European members of IACA.
The decision to create a semi-autonomous Assembly under the IACA flag was taken at this time to enable more active and direct contact with the Council of Europe under whose supervision will rest the formation of future European transport policies.
EURACA recognizes that the European Economic Community is working toward the unification harmony and cooperation of its member states and the Assembly believes that it is only by establishing unified, liberalized and non-discriminatory conditions under which charter carriers can operate, that low-cost air transport can develop and flourish in the best interest of the consumer.
With a greater increase in leisure time amongst the working populations of Europe, there is an ever growing demand and social trend for low-cost air travel and one to which both the Council of Europe and Governments outside the EEC should respond by creating an environment encouraging the growth and free flow of charter traffic.
The current eleven members of EURACA voted Mr. Peter Hanrath, General Manager of Transavia Holland and 2nd Vice President of IACA, as the first Chairman of the Assembly and Mr. Garlan Eriksen as Permanent Secretary General of the group. It is proposed to base EURACA in Geneva alongside the IACA Headquarters to afford the closest working relationships between the two secretariats.
In addition to legal and administrational tasks specifically related to regulatory procedures within Europe, EURACA's activities will concentrate on the economical, fiscal and operational conditions affecting European charter carriers and their passengers.
As a group the Assembly will work towards combatting ever increasing costs in navigational charges, such as those imposed by Eurocontrol, landing and handling fees and the implementation of new governmental taxes and levies on charter traffic.
These charges are specifically discriminatory against the development of low-cost travel. As such they are not in the public interest since it is the passenger who ultimately has to bear the increases in the overall ticket price.

EURACA aims to cooperate as closely as possible with all bodies and agencies involved in the safety and efficient operational aspects of air travel in matters such as air traffic control, airport facilities and security to continue to maintain the highest possible standards and services for the travelling public.

Eurocontrol ignored again, but....

Airlines need more Funds for new planes

Up to $90,000m will be needed by the 109 International Air Transport Association members to finance new airliners over the next decade, but at current earnings, less than one-third of these needs will be met by internal funds, the annual meeting of the association was told today. Mr. C.J. Simons, chairman of Eastern Air Lines, said that the ability of the industry to raise the rest of the funds externally would depend on its economic performance. Measured in terms of profitability and debt/net worth ratio, the industry was far short of accepted standards.
This had meant a reduction in the availability of funds from commercial banks and insurance companies, and a greater dependence on innovative forms of borrowing, although under less favourable conditions.
Mr. Simons recommended that advantage should be taken of current profitability to issue equity so that institutions such as the Exim-bank should be encouraged to recognize the longer working lives of current aircraft, and increase the period of loans to 15 years.
Delegates expressed alarm at the state of the air traffic control system in Europe, and Mr. David Kennedy, president of Aer Lingus, forecast that if IATA did not take remedial action, the system would collapse ,,within two or three years".
Mr. S.J. Casey, chairman of Braniff International said unified action was needed to plan an overall air traffic control system for Europe which would permit the foreseeable increase in traffic to be handled efficiently.
Dr. R.R. Shaw, assistant director general of IATA said: ,,There is no will in the Governments of Europe to have a coordinated management and planning air traffic control system. There are plans in one country which may be fine up to the border, but across the border, the next country does not have a coordinated plan."
Iberia challenge: Iberia the Spanish airline should inspect Gatwick, the second London airport, ,,before making outlandish claims" of financial loss if they were forced to move there to relieve the pressure on Heathrow, Mr. Alastair Pugh, managing director of British Caledonian Airways, told the meeting.

(The Times)

The first of the elephants

Within the aviation world, the 1970s will possibly be best remembered for the introduction into service of the Boeing 747 and the subsequent widespread use of the various huge, wide-bodied jets. The technology of these Jumbos is new, but the concept of giant civil airliners dates back to the early 1940s. The British Aircraft industry has all too frequently suffered through national economic recessions. Its first Jumbo eventually turned out to be of the white variety due to political lack of faith.

In 1941 the Air Staff issued specification B.8/41, for a heavy bomber to carry a bomb load of 10,000 lb at 300 m.p.h. over a range of 4,000 miles. The Bristol Aircraft Company was neither invited to tender to this specification nor informed of its existance until 1942, when it was asked to submit a study for a larger bomber of 100,000lb all-up weight, with four Centaurus or six Hercules engines. It was soon evident that to meet the specified range and speed, with an adequate margin of drag for two or three gun-turrents, a substantial reduction in overall drag was essential. Analysis of the best existing designs showed than convential wing-mounted engines accounted for 30% of the total drag, although only 5% was needed for cooling. Power plants completely submerged in the wing were thus likely to reduce total drag by 25%, if technically feasible. Obviously the wing would have to be at least as thick as the height of the engine, and coupling several engines side-by-side to a single airscrew unit located well inboard would leave the outer wing free from interference and available for fuel storage. Investigations indicated that still larger aircraft could acheive ranges between 4,500 and 5,000 miles. German penetration into Russia and Japanese gains in the Pacific emphasised the need for a really long-range bomber, and the Company's proposal for a large 5,000 mile aircraft met with some interest. Outlines were studied with six Centaurus, eight Griffons and, eventually, eight Centaurus engines. The last of these in November 1942 showed a mid-wing monoplane of 225,000lb all-up, 225ft span, 5,000 sq.ft wing area and aspect ratio 10, the limit imposed by structural considerations. The depth of the inner wing was then just adequate to submerge a Centaurus without excessive thickness/chord ratio, but only if the engines were closely pitched in a coupled power plant arrangement. The final Bristol ,,100-ton bomber" had a very slender fuselage and a butterfly tail, close to the ideal minimum drag shape. Comparable designs, some tailless, were put forward by other firms, but were all rejected in favour of increased production of Lancasters, and it seemed that no further interest would be taken in the project.

Then, just before Christmas 1942, a meeting of chief designers was called by the Ministry of Aircraft Production to discuss the practicability of developing a civil transport of similar range and performance, as a post-war challenge to the monopoly already attained by American manufacturers. The Bristol Aircraft Company was again not invited, but immediately protested against exclusion, sought BOAC opinions on large aircraft, and sent a representative to the meeting in London armed with the Company's proposal for a 5,000 miles transport derived from the 100-ton bomber. A committee had been set up, under the chairmanship of Lord Brabazon of Tara, to enquire into the types of civil aircraft needed in the immediate post-war period. This committee produced a recommandation for five types of aircraft, ranging from a London - New York non-stop express airliner to a small feeder transport for internal services. The first project, known as the Brabazon Type 1, was to have priority in design and prototype construction, although production models could not go into service for at least five years; such a project could only be undertaken by a firm with long experience of the structural problems involved, and it was assumed that a firm already building large bombers would receive the contract. However, all such firms were already fully engaged in bomber production, with no spare capacity for a large new project. In March 1943 it was announced that the Bristol Company was to be invited to design the Brabazon Type 1 airliner on condition that other work was not affected.

In April the formal invitation was sent to the Company, asking for the firm's views on allocation of the sub-contracts necessary to get so large an aircraft built. Following the Company's reply, the M.A.P. intimated that two prototypes would be ordered with a maximum of ten production aircraft in view, although materials were to be ordered only for the prototypes.

A cruising speed of 300mph had been chosen for the 100-ton bomber to minimise vulnerability, and duration was a secondary consideration, but passengers needed a much larger body than bombs and there was no consensus of opinion on how many passengers should be carried. BOAC stated that passengers would not tolerate a non-stop flight longer than 18 hours and recommended 200 cu.ft. per passenger for ordinary comfort and as much as

270cu.ft. for luxury travel. It was generally agreed that a high standard of comfort should be provided for as many passengers as possible, and that the air-conditioning system should ensure an equivalent cabin altitude no greater than 8,000 ft. when flying at 35,000ft. The first layout showed a body of 25ft. diameter divided by a level floor into two decks, with sleeping berths for 80 passengers, together with a dining room, promenade and bar; alternatively there were day seats for 150 passengers. The sleeper version was preferred as a paying proposition because a supplementary fare for sleeping berths was acceptable; passengers needed less food and entertainment while sleeping, and the weight penalty of air-conditioning, sanitation, food and water for 70 additional day passengers was substantial. It soon became clear that the drag of a 25ft. body was too high and a single deck layout of 20ft. diameter was next examined, providing a bar and promenade, but no dining room, for 52 sleeping passengers or 96 day passengers. Both M.A.P. and the Second Brabazon Committee (including industry and BOAC members) favoured a medium sized body associated with a fairly high speed. The Committee recommended adoption of the Company's proposal for a 50 passenger aircraft of 250,000lb all-up weight, to be defined by Specification 2/44. BOAC promised support for this layout, although they preferred a smaller one for only 25 passengers.

A small civil project team undertook extensive preliminary layout work to determine the best arrangement of power plant and landing gear as well as interior accomodation. By November 1944 the main features of the design, Type 167, were crystallised, with four pairs of coupled Centaurus engines mounted forward of the front spar driving co-axial tractor airscrews, a conventional tail unit, a fuselage maximum diameter of 16ft 9ins, a nose-wheel landing gear with multiple wheels and flexible fuel tanks in the outer portions of the wing. The designation Type 168 was reserved for a possible military variant, but no design work on this was ever done.
The overall design was orthodox, extreme care being taken to reduce and control weight at all stages, and the aluminium-clad light alloy plates and sheet material were rolled to specially close tolerances and checked for uniformity of guage in the middle of the sheet as well as at the edge; rivets were graded to fit their holes accurately and their tail lenghts were controlled to save weight.
in so large a structure it was possible to defeat the ,,square-cube law'' by determining the exact sections needed to carry the stresses, and the wing weight was kept down by sharing the span-wise loads between mainly evenly spaced extruded stringers which replaced the concentrated booms of a conventional two-spar wing. Similar use was made of continuous stringers in the fuselage, heavy longerons being reduced to a minimum. Mock-up construction began, methods of construction were examined by a co-ordinating committee, and the first manufacturing drawings were issued in April 1945.

At first it was proposed to build the prototypes at Weston-super-Mare, but the subsoil was unsuitable for a runway of the strength required, so reluctantly the Company had to extend the Filton runway, although this involved closing a new dual-carriageway bypass road and demolition of part of Charlton village. Naturally this raised local protests and the proposals were not finally agreed by all the parties concerned until March 1946, after the whole project had been referred to the Cabinet.
This was only one of the many legal, political and technical problems which arose after construction of the first prototype began in October 1945 and delayed the first flight until 4 September 1949. In the intervening period, quite apart from the aeroplane itself, a prodigious supporting programme was undertaken, including static structural testing of a complete half-scale wing at the R.A.E., pressure testing of a front-fuselage specimen, endurance and type tests of the coupled power-plant on a wing-mounted test-rig and exhaustive functioning tests of all the hydraulic flying control units and landing gear mechanisms, the complex electrical installation and the air-conditioning system, to say nothing of the construction of a specially strong runway and 8-acre three-bay assembly hall. The cold weather of early 1947 delayed completion of the latter, and only the east bay was ready to receive the fuselage shell with its integral 100 ft. span inner wing and 55 ft. tail plane when this assembly was taken out of its building jig and towed half a mile to its final erection site on 4 October 1947, an operation more like the launching of a ship than with a land aeroplane. Indeed the method of constructing the Brabazon, in a light-weight skeleton cradle mounted on removable vertical stanchions, owed more to shipbuilding methods than to aircraft practice. During the 23 months which elapsed between this event and the first take-off, flight tests on a Lancaster (RE131) proved the hydraulic surface control units, and a Buckmaster (RP164) flight-tested the combustion heaters for wing and tail de-icing; the outer wings, fin and rudder were assembled; landing gear, hydraulic, electrical and fuel systems were installed and in December 1948 the complete aircraft (No. 12759) was rolled out for initial engine runs, fuel loading and ground resonance tests having been cleared some weeks earlier.
It had been agreed in 1946 to fly the first prototype as an unfurnished testbed with a comprehensive array of data-recording equipment, although the possibility of furnishing it later for commercial use was not excluded. The second prototype (No. 12870) was to be fully furnished and equipped to carry 100 passengers, and powered by four double-Proteus turbine engines, which were also adopted for the Saunders-Roe Princess flying boat of similar size to the Brabazon. The requirements for the Brabazon I Mark II were set out in Specification 2/46, to which a tender design was formally submitted in June 1947, the date by which it had originally been hoped to fly the first prototype. The economy of the Proteus engine in civil operation relied on a mini-

mum cruising speed of 330 m.p.h. at 35,000 ft.; this could only be permitted if a satisfactory gust alleviation device were installed to protect the wing from the direct effects of the severe gust design cases on which the airworthinees authorities insisted; this comprised a gust-detector in the nose, 80 ft. ahead of the wing, which moved the ailerons symmetrically in the sense needed to cancel the effect of the gust, and an aileron response rate of not less than 60 degrees per second was required. Without such a device there would be either an unacceptable imitation of cruising speed or an equally unacceptable increase in wing structure weight. The second prototype had an improved wing structure incorporating integral fuel tanks, with top-hat stringers instead of Z-section, but flexible fuel-bags were reintroduced later because of the fire risk with integral tanks in a heavy landing; the dihedral angle of the outer wings was increased from 2 to 4 degrees to reduce trapped fuel and increase wing-tip clearance. A change was made from fully duplicated power controls to aerodynamic servo-tab controls with modified power assistance and partial manual reversion, and the full-span servo-tabs required straight trailing edges for the rudder and elevators. A further design change, subject to trial on the first prototype, was a four-wheeled bogie main undercarriage unit, to reduce the runway loading at existing airports. Although most of the difficulties associated with the second prototype were solved, the gust alleviation problem proved intractable and was a compelling technical reason for the abandonment of the Brabazon I Mark II when half-built, although the decision was mainly a political and financial one. The size of the project seems to have overawed the authorities, who tended to demand ,,both belt and braces", as, for instance, by insisting on the addition of mass-balances to control surfaces designed from the start to be irreversible and therefore flutter-free, whose actuators had been proved by endurance tests to be reliable.

On 4 September 1949 the Company's newly appointed Chief Test Pilot, A.J. Pegg, found no difficulty in handling the Brabazon I (G-AGPW) on its first flight; subsequent flights went as planned, and even when a hydraulic pipe failure necessitated landing with the flaps up, the Filton runway and reversing airscrews proved adequate. On its demonstration flights at London Airport on 15 June 1950, and at Farnborough in September the same year, the Brabazon was acclaimed for its smooth and easy manoeuvrability on the ground, short take-off run and even shorter landing run. Partial furnishing of the rear fuselage with a bar and 30 B.O.A.C. reclining seats for demonstration to official passengers confirmed how silence, comfort and freedom from claustrophobia and fatigue could be achieved in a really large aeroplane as in no smaller type. It is true that recurrent fatigue cracks in the airscrew mounting structure prevented the issue of an unrestricted Certificate of Airworthiness in connection with its proposed hire as a peak-load carrier by B.E.A., furnished for 180 passengers for the London to Nice service, and that it would have had an overall airframe fatigue life of only 5,000 hr. in the light of later experience, but many years after the event it still seems regrettable that its total flying time had amounted to less than 400 hours when it was broken up in October 1953. A spare nose wheel and oleo-leg assembly was the only relic saved from the wreckers for exhibition in the Science Museum, London, but so satisfactorily compact a component can give future generations little idea of the majestic flight and serene progress of the Brabazon, whose beautiful lines deceived the eye into seriously underestimating its actual speed.

Like Brunel's Great Eastern steamship, the Brabazon was a pioneer on the grand scale born a generation too soon for its environment. Soon after its demise, wiseacres confidently predicted that no civil aeroplane so large would ever again be built, but within ten years fleets of 300,000 lb. airliners were the order of the day.

SPECIFICATION AND DATA

Type	: 167, Brabazon I
Manufacturers	: The Bristol Aeroplane Co. Ltd., Filton, Bristol
Power Plants	: (MK 1) Eight 2,500 hp Bristol Centaurus XX (MK 2) Four 7,000 hp Bristol Coupled-Proteus 710
Span	: 230 ft
Length	: (MK 1) 177 ft; (MK 2) 178 ft 10 in
Height	: 50 ft
Wing Area	: (MK 1) 5,317 sq ft (MK 2) 5,422 sq ft
Empty Weight	: (MK 1) 145,100 lb (MK 2) 160,000 lb
All-up Weight	: (MK 1) 290,000 lb (MK 2) 330,000 lb
Max. Speed	: (MK 1) 300 mph (MK 2) 360 mph
Cruising Speed	: (MK 1) 250 mph (MK 2) 330 mph
Cruising Altitude	: (MK 1) 25,000 ft (MK 2) 35,000 ft
Range	: 5,500 miles
Accomodation	: (Crew) 12 (Passengers) 100
Production	: (MK 1) 1 (MK 2) 1 (not completed)
Sequence Nos.	: (MK 1) 12759 (MK 2) 12870

(Adapted from ,,Bristol Aircraft since 1910" by Ch. Barnes. Extract and photograph provided by, and reproduced by kind permission of the Bristol Filton division of British Aerospace).

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