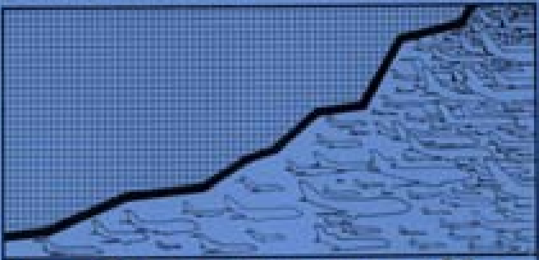
EGATS FORUM • 16th NOV 1988



to fly or not to fly

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the magazine of the EUROCONTROL GUILD of AIR TRAFFIC SERVICES

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EGATS
EUROCONTROL GUILD OF AIR TRAFFIC SERVICES

Contents

AN INTERVIEW WITH DOCTOR VON VILLIEZ

by Jan Gordts and Geoff Gillett

After nearly eighteen eventful years at the steering wheel of the Maastricht UAC, DR. FREIHERR H.J. VON VILLIEZ reveals details about this most significant part of his career.
An interview......

EGATS : When we consider your career, Doctor von Villiez, we notice that aviation has played an important role in your life : you studied physics at the Technical University Berlin and later became an assistant at the "Institut für Flugführung und Luftverkehr" of this university.
Your Doctor's degree was based on a study about flight following in the proximity of aerodromes and course precision of aircraft.
Were you in fact not aiming for a career in aviation science and technology rather than to become involved in the management of European ATC ?

VV : Towards the end of my activities at the Technical University there were three distinct offers on the table:

a) to join the aviation industry (Focke-Wulf/Weser Flugzeugbau at Bremen);
b) to join the BFS in order to get their experimental centre started, and
c) to join the Association Eurocontrol at Paris and to assist in building up the European Organisation for the Safety of Air Navigation".

It was the attractiveness of international cooperation as a real "must" which made me accept the third offer with the additional need to learn a further foreign language, namely French.

EGATS : When you entered EUROCONTROL in 1962, the idea of a multinational ATC concept in Europe was still in the planning phase and in 1970 you were asked to become the Director of the first international ATC Centre in Europe.
How did you react to being posted in this unique function ?

VV : I reacted favourably to this request as it was a real challenge to forge all available resources into something real, tangible, functioning. This decision of our then Director General and the Committee of Management was felt by me as a distinction and in taking it up, I had declined an offer from Berlin to enter into a university career.

EGATS : Which were in your opinion the milestones in the development of this Centre ?

VV : In a quick scan one is inclined to see as milestones the events which marked the successful implementation of major projects which enabled from the very first day of our MINFAP operation (1.3.1972) the development of the centre to its present performance level. However, I consider a different category of actions as milestones, for instance the full participation of our controllers in making a predominantly digital system work as a powerful air traffic control tool, or the mental integration of our military partners in the airspace, into a safer form of civil/military cooperation as we operate here with them since more than 12 years, or, more recently, the fresh start of cooperation with our directly involved National Administrations, in the interest of an eventually common operation of 5 civil centres (Amsterdam, Bremen, Brussels, Düsseldorf and Maastricht) together with the associated military ATC centres working in the same area. These are the sort of milestones I have in mind, as there is in all of them a fundamental common element: the human being! It is quite obvious, and permanently confirmed by experience, that this approach requires a clear determination to reach the respective goal, however, coupled with a good deal of patience.

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EGATS : Besides managing major system and technical developments in Maastricht,you spent many hours at the conference table.
Do you estimate that politics in Europe can actively contribute to the development of our European ATC system or is this still a dream ?

VV : Of course politics can contribute to the coming into being of a European ATC system and I think the politicians must contribute. Today's air traffic level clearly demonstrates that isolated national measures are no longer adequate to cope with present requirements. The call for solutions at a European level cannot be ignored. However, the complexity of the subject is such that one cannot expect "a European ATC System" as the straight forward solution. Such a system must and will be the ultimate aim, and all will have to work hard in a step by step manner to eventually arrive at this aim. If we put aside the well-known difficulties caused by the interest of people, individual intentions and weight of importance, there are still sufficient differences in terms of national legislation, status and pay of staff, let alone the facts of sovereignty.
As long as there are people who remain convinced of the need for a supranational system and who are prepared together with realistic politicians to carry on, the European ATC system will become reality.

EGATS : You found a remarkable way of dealing with your staff members : you address them in their native language and you spare no effort to establish a personal relationship with them. We often wondered how you could remember all these anniversary dates !
What is the secret of your diplomacy ?

VV : In your opening statement to this question you already provide the answer. There is no secret about my way of staff treatment. Almost all "systems" comprise a vital human element, not only in air traffic services, which requires a very careful "maintenance". The recognition of this necessity for me translates into interest for the individual, time to listen, attention for personal problems and assistance in overcoming them as far as such help is possible or desirable from the point of the person concerned. The question of paying regard to the anniversary of an individual is not so much a matter of an efficient agenda or a reasonable memory, it is more a matter of attention to the person.

EGATS : Together with Messrs. G. TROW, M. SCHMIDT, H. GÜNTHER and H. FLENTJE you made a team of fighters for the so called concentration concept.
Unfortunately this concept was lost and integration will become the basis for the continuation of this Centre.
Do you estimate that your combined effort has been a success ?

VV : I do not think it to be appropriate in asking for an answer whether the effort invested into the feasibility study of a concentration concept was a success or not.

In view of the politically formulated task to study such a concept and on the conviction that this would have been a major step into a genuine European ATC system, it was clear that we pulled all forces together so as to prove the viability of such a concept and its principle feasibility. As the Ministers failed to live up to the necessary consequences and as we were facing heavy resistance from the respective services in the National Administrations, on that score, the European ATC system nucleus was lost. This was the moment when the Director General tasked me to take up the Agency's part and to try to find terms at which it was possible to re-establish an acceptable working relationship with the Administrations concerned. The result of this endeavour is known to you and that is called the "Integration Project of the 4 States and the Eurocontrol Agency". Watch it! But work for it with all available forces as this is the most realistic way to Europe in ATC.

EGATS : This year has shown a massive increase in Air Traffic.
How do you see ATC in the year 2000 ? Will the system be able to cope in the end and which are, in your opinion, the essential elements to enable this (technical and human) ?

VV : You will appreciate that it is not possible in the frame of such an interview to dwell upon the expected ATS system around the year 2000. If I try to summarise the present, essential considerations which have governed my contribution to the intended common operational concept for the 4 States/Eurocontrol Integration Project, then the following few sentences might answer your question:

The human being, assisted by modern but proven technology in data acquisition, data processing and display, will still be the backbone of the ATC system at the end of this century. Advanced data processing functions in the flight data handling and the coordination process will greatly help the controller to handle safely the increasing traffic flow. The planning control function will become a traffic management function with the help of automatic profile calculation and conflict probe and an automatic exchange of coordination messages with his civil and military partners, functions which will operate through a much greater volume of airspace than a single sector.

The now available results of expert working groups provide the concept for the infrastructure to enable best use of all available radar data and their distribution and the automatic exchange of flight data and the operational coordination messages. The aim will be to have the best quality of data as well as the above mentioned advanced functions available in all centres participating in the integration project. This should eventually not be limited to the 4 States and Eurocontrol Maastricht U.A.C. Of course, this concept requires a comparable degree of sophistication in the hard- and software systems operated by these centres. It is reasonable to assume that such a situation will be reached during the last decade of this century.

With these tools, minimum separation standards will be applicable in the whole airspace and thus allow its optimum, and with regard to civil/military cooperation, its transparent use for the benefit of all airspace users.

EGATS : Your retirement will undoubtedly enable you to devote more time to your hobbies, will aviation still have a priority ?

VV : In my plans for the future, aviation will continue to be of importance. Apart from a general interest I intend to pursue my lecturing activity on air navigation matters at the Technical University of Aachen as long as I feel that I have to offer something to the young generation. On the other hand I shall devote somewhat more time to my real hobby of flying, in order to keep my IFR rating up as long as the doctor will sign my medical certificate.

EGATS : The EGATS board wishes to thank you for the many years of good support and cooperation with our professional association and we hope to see you often at our venues.

One method of keeping in touch would be to contribute an article from time to time for publication in our magazine "INPUT".

We hope to hear from you.

VV : I should like to use this interview to put on record my appreciation for your effort which you have invested in making EGATS a worldwide known professional organisation with a good reputation. Through this successful work you have likewise contributed to the image of Eurocontrol and its upper area control centre. To this I wholeheartedly add my personal thanks for the always pleasant manner in which we were able to cooperate throughout this long period.

I wish you further success in future and I shall endeavour to keep a living contact with EGATS well beyond my active Eurocontrol time. So, I accept with pleasure your invitation to be present at your Forum in Heerlen on November 16th, 1988. So long!

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don't forget (WRITE IT DOWN)

NEXT COPY DEADLINE:

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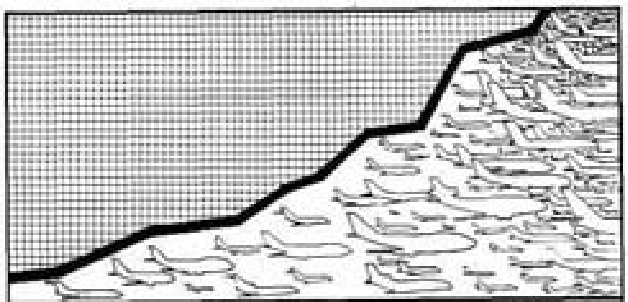
a FORUM you can't afford to miss !



to fly or not to fly

16 November 1988

MOTEL HEERLEN

Revised Time Table

0800-1000	Arrival Delegates.
1000-1010	Welcome word Director Maastricht U.A.C., Mr. P. Stalpers.
1010-1020	Opening speech by President EGATS, Mr. J. Gordts.
1020-1040	EGATS presentation by Mr. S.R. Ralston, title: Airspace Limitations - Safety or Politics.
1040-1100	Pilots presentation by Mr. Leroy, Dutch Pilot Association.
1100-1120	German Air Force Presentation
1120-1230	Initial questions/answers on morning session.

LUNCH

1345-1415	Administration presentation by Mr. W. Bodenstein, Eurocontrol HQ, Division 0.3.
1415-1445	Manufacturers presentation by Mr. H. Cole, representing the IFATCA Corporate members.
1445-1515	Discussion on afternoon presentations.
1515-1545	Coffee break.
1545-1700	Forum discussion on the whole problem.

A cocktail will be served at 1900 hours, followed by a dinner (optional, costs Hgl. 45,-- p.p. incl. wine) at 1945 hrs.

Brochures and registration forms to be distributed soon (internally).

Several interesting registrations from airlines, administrations and manufacturers, including some press have already been made.

SEND IN YOUR REGISTRATION SOON
(Closing date 15.10.1988)

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EGATS
EUROCONTROL GUILD OF AIR TRAFFIC SERVICES

— BUYING A BOEING —

by Simon Winchester

PARTING IS SUCH SWEET SORROW

Every eight days the production line at Boeing rolls forward, and another mighty jumbo is ready for collection.

There is not, quite frankly, a great deal to recommend the spot which is fixed on the globe at Longitude 131 degrees west of Greenwich and Latitude 44 degrees north of the line.

It's probably an okay sort of place for herrings. Doubtless it is fine and dandy for the passing sea-lion, and by all accounts it's not a bad resort for the reasonably energetic gull or auk. But otherwise, for the average man in the street, it is manifestly not a place at which to linger, either by accident or design. To save you the trouble of reaching for atlases and gazetteers it is perhaps appropriate to explain that this unique (and, as we shall see, uniquely important) dot on the globe is in the middle of the sea. To be more precise, it is a very foggy and stormy part of the northeast Pacific Ocean, 200 miles off the coast of the American state of Washington.

Two hundred miles exactly. This is what's really important. This single aspect of the great mass of sea beneath which 44 north Latitude and 131 West Longitude meet gives it a very particular significance - a significance that goes far beyond its ability to give pleasure or challenge to dolphin, albatross or eel. For reasons that are a complex mixture of geographical accident, national politics and economic necessity, this point happens to have been chosen as the site for the consummation of a particular type of business deal, worth thousands of millions of dollars

The senior people are taken out to Everett to see their new plane, to make sure all is as they expected - that the seats are the right size, the colour scheme is perfect, the loos are all in the right place (it costs a cool million dollars if you ask Boeing to place a loo in a "non-standard site", which is something to reflect on during those most boring moments of flight), that the cockpit controls read accurately, the wheels are acceptably round (not always guaranteed, bearing in mind the 200 tons riding on top of them).

Then they fly it (Boeing already has, to make sure that the wings are the right way up, and that the engines blow the air out in the correct direction). If the pilots and the engineers feel happy, then arrangements are started -lawyers are briefed, accountants are readied, bankers are instructed, vaults are opened - to do the deal, If they don't like what they feel - if the plane feels heavy, or sluggish, or the engines make an odd noise - then they ask for changes, and arrange to take it for a spin next day. And, if necessary the next day. And the next.

But, finally, D-for Delivery-day. The night before the customer has been given a banquet, the host invariably a burly Boeing figure who has the title Vice President, Contracts, and whose burliness is not unrelated to the fact that he has to attend a banquet almost every eight days. The pilots, though they are free to attend the party, are not allowed to drink, and so are the only ones who have clear heads when, shortly after breakfast next day, the Boeing bus arrives to take everyone from the hotel up north to Everett, and to the 747 Delivery Center. Here the last details are discussed: the route home, the weather, the fuel quantity, the passenger load for the journey.

In a small room off the main factory floor pert waitresses serve canapès, hand round souvenir stickers and funny hats. This is the kind of party Americans do well, geared to keeping everyone happy while the final technical problems are sorted out. Over at the plane an engineer is working on the video system which has developed a flutter, someone has discovered that the fire warning system is behaving erratically, the fuel bleed line has become blocked with metal shavings. At last the shuttle buses arrive and the 40 who are off across the Pacific are taken out to clamber aboard the plane - gleaming and new in the early morning sun. The pilot gives a thumbs up. Instrument lights glow green. The Boeing Field's brilliant yellow fire engines idle away, and a small group of the men who helped build the plane stand to one side, and watch, some with a small sorrow, some with evident pride, as another of their great master pieces begins to edge away from the factory door, and out onto the runway. A few moments later and the hundreds of tons of glittering new steel roars past them, and they wave and cheer as another Boeing Big Top lifts its nose into the air, and heads off west, out to the coast.

As this point a Boeing captain is at the controls since the plane belongs, in law, to Boeing. It may sport the colours of the customer. It may have been designated a customer number for the flight controllers below. But for a few minutes longer this $ 100,000,000 craft is the property of the Boeing Commercial Airplane Company of Seattle, and its ownership will not change until one small detail has been definitively settled, to everyone's satisfaction.

The money.

The customer has paid about 13 per cent down - he did so when he placed the order, months before. So there is, give or take the odd hundred thousand, around $ 89,675,000 left to pay.

INPUT magazine

Boeing wants that money before it will part with the plane. The customer wants to give the money up only at the very last moment, interest rates on that kind of cash costing something in the region of $ 30 a minute. And so the plane hurries out across the sea, to the sales point, the navigator calling out the coordinates from his inertial navigation system.

"Steady on 44 North," he calls. "One twenty-nine, thirty, West". Then it is 130 degrees, 30' West, then "on coordinates. Two hundred miles out. Steady as we go!" And everyone suddenly gets very interested.

A complicated high-frequency radio circuit is opened - from the plane to the Boeing Company, from the plane to the customers's lawyers in Washington, to the customer's bankers in New York, and, crucially, to the Boeing lawyers. A series of code numbers are read out - the customer's instructions to pay over the $ 89 million. The lawyers evidently agree, and they instruct the bank. The bankers in New York, 3000 miles back east, hand over the cheque (all transactions have to be done in mid-morning. Seattle time, before the Manhattan banks close for the day).

The Boeing lawyers call to verify the account details, and that the money is there, and that the cheque won't bounce. The money is transferred. The lawyers issue a coded signal to Boeing. Then Boeing sends up its final command.

"Okay Captain. We no longer own the plane. Hand over the controls please. The deal is complete".

And the Boeing captain removes his silk gloves, and steps out from the captain's seat, out of the cockpit and into the cabin. The customer's pilot, who has been waiting anxiously for this moment walks past him, into his new cockpit. He pushes back the seat, and eases himself into it. The new leather squeaks, He takes hold of the wheel, presses his feet against the elevator pedals and their unworn rubber pads. He takes the microphone, utters some protocols down to the San Francisco Air Traffic Control and on to Hawaii Oceanic Control, about his intended route across the Pacific. He fiddles with some controls, and the angle of the sun changes as the huge aircraft turns its nose off to the left.

The plane now belongs to the customer, and the directors back in the cabin open the first of their many bottles of Krug. They've spent nearly $ 90 million, and, so far as one can see, they didn't feel a thing. And why, was all this done over a crackling radio circuit out at sea? Why not in an office, sensibly, as one would imagine? Because, as one of the customer's directors explained with an impish grin, beyond the 200 mile limit no American tax - whether state, federal or municipal - can be levied on any commercial transaction.

So the buyers, with Boeing's help, flew to a point just outside it. They thereby conspired to save themselves rather more than $ 4.500.000 for a mere morning's work. More bottles of Krug are immediately opened as this happy realization begins to sink in. And many more would be opened as the plane rumbled smoothly across the limitless Pacific, towards its new home base, and the beginning of its thousands of hours and uncountable route miles of life as a long-hauljet•

MILITARY AIR TRAFFIC CONTROL AND ITS SPECIAL SUPPORT FUNCTION FOR OPERATIONAL AIR TRAFFIC

by O.T.L. Faber

Since some time, but especially during the last year, headlines pile up about delays of airliners due to a continuous increase of air traffic, about limits of performance and shortage of personnel amongst air traffic controllers, about the organisation, structure and competence in aviation. The overall demand therefore is : AN URGENT NEED FOR ACTION.

On 9th March, 1988, this statement was made also by all fractions of the committee of transport in the German Bundestag corresponding with a report of the government about the actual problems of ATC and the other services of the Federation concerned with aviation.In view of a possible doubling of controlled IFR flights by the year 2000, to about two million flights per year (only 12 years to go!) it is necessary to see aviation as a "SYSTEM-COMPLEX" and to find an overall solution in which we achieve a close cooperation between airline companies, airports, aviation industry and air traffic services (ATC, Met-services and the Federal Office of civil aeronautics). Military aviation has to be considered as an integrated user of the airspace and as an element of the whole system.

It's the aim of the author to deliver a contribution to this complex situation.

1. Changes with effects on ATC services

Obviously changes have been taking place during the past years, which are noticeable nowadays.

a) The civil air traffic has changed in its conduct, in the number of participating aircraft, in its spectrum of performance and thus in its demands.

b) The operational air traffic has changed also; although the number and performance of participating aircraft remained almost constant, there were greater demands on ATC services.

c) A main reason for the altered demands in the use of airspace is a change of mentality in the world around us which takes effect on rules, structures and organisation for the use of airspace, also on the conduct of air traffic (civil and military) and ATC.

d) On the military side, conceptual adaptations and developments in the strategy of the NATO Alliance are taking place, as well as a changing assessment for a possible threat. This

consequently affects the organisation and tasks of the military ATC services.

e) The technical progress and the increasing automation of ATC systems lead to facts, which cannot be influenced by single groups, but more and more mark the operating structure and the conduct of ATC services and thereby influence the airspace user.

2. Particularities of Civil Air Traffic

The main task of civil air traffic, except General Aviation conducted in visual meteorological conditions (VMC), is to transport people and material in a safe, economical and fast way from one place to another.

Following that we find typical peculiarities for civil air traffic:

a) The civil air traffic has standardised flight profiles and routes. Changes thereto are made only in exceptional cases;

b) Civil air traffic can be up to 80% pre-scheduled in the long-term (repetitive flight-plans);

c) Fuel economy is desirable, but for reasons of flight safety and limited flying time, not compelling;

d) The national and international air traffic administrations lay down and determine mandatory, standardised operating procedures for airspace usage and operational conduct.

e) Traffic congestion is, due to long-term planning, predictable. Reactions hereto are in most cases possible by flow regulations. Therefore, traffic in excess of capacity can, after coordination with other air traffic administrations, normally be prevented.

3. Factors which determine OAT

a) Operational task

The tactical training and operational readiness of the Luftwaffe serves the purpose of the German Bundeswehr for peace and the security policy of the Federal Government, in order to deter an enemy from threatening war or using military force, to maintain political freedom of action during periods of crisis or tension and to reserve the territorial integrity of NATO countries in case of an armed conflict.

b) Geographical situation in respect of defence

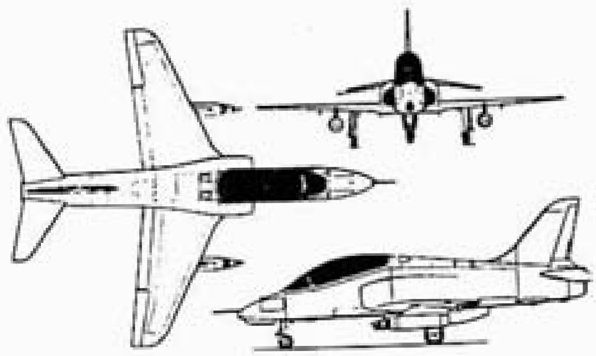
The geographical situation of the Federal Republic of Germany with its narrow North-South extension requires a quickly reacting air force, as an aerial warfare means, with the possibility to concentrate immediately on main points and to cover extensive areas

c) Location of military air bases

By high speed, a considerable reaction capability, range and flexibility, the air force will respond to any attack without delay and is able to concentrate on main points. For the training of these abilities the total airspace of the FRG must be usable for the air force. It must be guided quickly and via long distances, to all possible geographical positions.

d) Specific flight characteristics and equipment

Military aircraft, differ from civil aircraft in their high speeds, good manoeuvrability, navigational equipment and tactical weapons conceived for the mission tasks. The pilot handles not only an aircraft but also a weapon.



e) Meteorological situation

The weather situation over the FRG often forces the pilot, during his missions over long distances to fly under different flight rules. But this must not influence the task for the mission.(Combat readiness under all weather conditions!)

f) Flight physiological conditions

The flight characteristics of military aircraft, as well as the security measures to protect the pilot during his mission (Oxygen mask, Nuclear, Biologic, Chemical protective equipment, Anti-G-suit, cockpit space, illumination etc.) make high demands on military pilots.

g) Freedom of action for the commanding personnel

The freedom of action of the commanding personnel responsible for the air force is orientated on the kind of mission. Commanding personnel deploy the concentration of the mission in accordance with the technical and tactical possibilities, the consideration of the airspace structure, congestion areas, safety in the airspace, weather and possibilities of control during the mission.

Therefore, certain facts have to be taken into consideration during the planning and performance of the mission, facts that specify the military flying operation compared with those listed under Nr. 2 for civil air traffic. These facts are:
- only short term planning is possible for military air traffic;
- flight profiles and/or routeings are often complicated;
- air traffic control has to react to ad-hoc changes of tasks;
- short routeing to the tactical area and back is essential due to fuel and weapon load;
- there is hardly any possibility to avoid local concentrations of air traffic;
- pre-planned flow control measures are normally impossible;
- radar-control procedures are required to support the missions;
- flexible procedures and unrestrained airspace usage are required for the conduct of the mission.

4. Different tasks of civil/military ATC

Due to the different tasks and requirements of civil and military air traffic, there arise necessarily, different mandates for the civil and the military ATC organisations.

a) The civil ATC concept has been developed to meet the requirements of civil air traffic. It is orientated in a neutral way in regard to the interests of airspace users and cannot consider the tactical demands of OAT sufficiently.

The division of airspace into a number of areas of responsibility and control sectors, which are defined in size and shape, mainly for the traffic flow of civil aircraft, make the support of OAT even more difficult, especially during operations on a large scale. The confusing distribution of responsibilities, additionally aggravates the request for ad-hoc support of civil ATC services.

b) The conduct of military flights must be possible at any time, to maintain their combat readiness. Therefore it is necessary that the appropriate authorities have the possibility to use a command and military control system as an integral part of the overall command and control system of the armed forces in order to support air force missions and to act in airspace surveillance. That means, that the military ATC and the air forces must be ready at all times and that the conduct of their tasks may not be restricted to certain parts of the airspace.

c) Civil ATC services guarantee, apart from their services for the economical and effective conduct of flights, in the first place a safe conduct of flight. This is achieved - to say it simply - by providing separation.

Military ATC services basically fulfil the same tasks, as long as they provide only ATC tasks.

Conclusions:
Civil ATC - Separation
Military ATC - Separation

As military ATC (-including its manpower and means in cooperation with other areas of command and control) is an indispensable part of the command and control and operating system of the armed forces, it provides additionally, support for operational missions (OAT).

Contrary to the neutral civil ATC, it therefore performs already during peacetime a mission-related support which is necessary for the training of the air forces, with the same essential degree of safety.

d) Military ATC has to guarantee during peace, crisis or in a case of defence that the flying weapon-systems on mission in the airspace of the FRG,

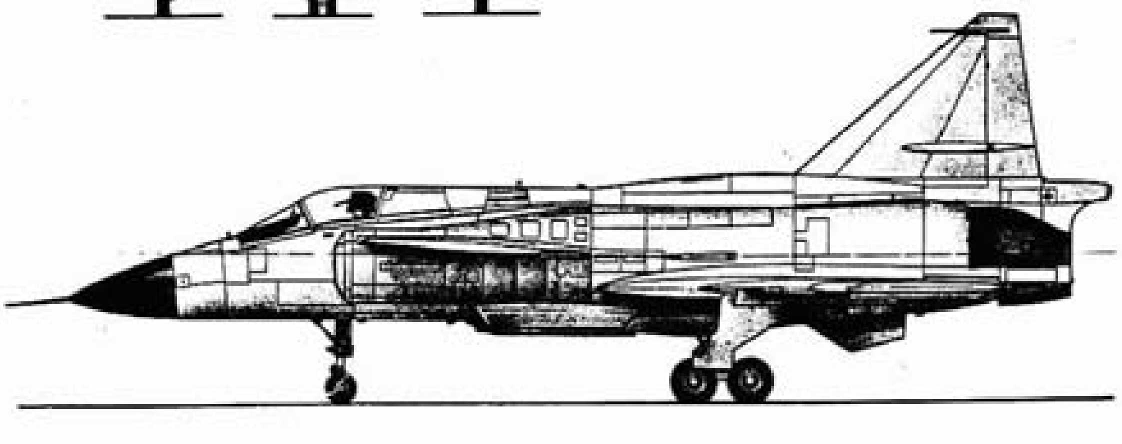
are able to fulfil their tasks unrestricted. Therefore the function of operational support has to be performed by the military ATC for the following reasons:
(1) Procedures, applied during crisis or in case of defence, have to be continuously exercised during peacetime;
(2) Military aircraft have to be guided by radar;
(3) Climbs and descents have to be orientated on the kind of tactical mission;
(4) Direct routeings to cover large areas (see fuel capacity) have to be made possible;
(5) Suitable exercise areas must be allocated appropriate to the mission or after coordination with the operations centre;
(6) Special tasks have to be performed by supporting:
- reconnaissance flights,
- air refuelling missions,
- air defence missions to the target area and back,
- alert exercises and tactical evaluation,
- emergencies corresponding to the different types of aircraft,
- aborts of low level missions,
- radar surveillance sites and other, e.g. local air defence stations,
- exercises within the long spectrum of different tasks and by monitoring special airspaces, in which specific military exercises are conducted.

(Temporary Reserved Areas (TRA);
Air Defence Exercise Areas (ADEXA;
Low Altitude Night Intercept Areas (LANIA);
Night Low Level System (NLL)).

Military ATC must be able to consider these tasks and to relieve OAT from strict routeings, procedure areas and prescribed times.

A good example is the flight of an E3A (AWACS), which keeps an ATC controller busy for about 6-8 hours, requires continuous care and control, but represents only 1(one) movement.

This special operational support related to the tactical task, need not be and cannot be performed by civil ATC. Military ATC therefore provides a quantitatively and qualitatively different task, exceeding the classical, civil type of ATC service that is also performed by military ATC personnel.



MALTA NEXT TO JOIN EUROCONTROL

The Permanent Commission of EUROCONTROL, the European Organisation for the Safety of Air Navigation held its 73rd Session in Brussels on 5 July, presided over by Lord Brabazon of Tara, Parliamentary Under-Secretary of State for Transport and Minister for Aviation and Shipping of the United Kingdom.

The Permanent Commission has unanimously in principle agreed to the accession of the Republic of MALTA to the Protocol Amending the EUROCONTROL convention and to the Multi-lateral Agreement relating to Route Charges both signed at Brussels on 12 February 1981.

The Republic of Malta will therefore become, after completion of the ratification procedure, the 11th Member State of the EUROCONTROL Organisation which was founded in 1960 by Belgium, the Federal Republic of Germany, France, Luxembourg, The Netherlands and the United Kingdom. The Republic of Ireland acceded to the EUROCONTROL Convention in 1985, Portugal joined the Organisation in 1986 whilst Greece's full membership will has become effective on 1 September 1988, and Turkey is expected to become a Member State in early 1989.

Referring to the decisions taken by the Ministers of Transport of the European Community at their Conference held in Luxembourg on 20 June 1988, the Permanent Commission concluded:

a. The introduction of measures to overcome urgent problems in European air traffic control capacity caused by the tremendous growth of air traffic in Europe is approved, making appropriate use of the available resources of the EUROCONTROL Agency and in close cooperation with the national authorities.

b. These approved measures included actions related to operational practices and procedures as well as actions for a better data flow between the European air traffic control centres to achieve a more differentiated and earlier forecast of the air traffic demand.

c. An improved organisation and utilisation of ground-ground communication links between the ATC centres concerned - already underway at the Agency - shall also speed up the exchange of data to reduce the problems in the field of ATC and their impact on air transport economy.

d. A declaration of principle to the effect that all necessary steps have to be taken to ensure that the appropriate budgetary means be made available, both at national and Agency level, for the implementation of measures designed to improve the efficiency of air navigation with the consequential impact on air transport economy.

The Permanent Commission instructed the Agency to examine the practicality, cost and benefits of developing the EUROCONTROL Central Data Bank (CDB) for Tactical Flow Management purposes to make the best use of the European air traffic control facilities at short notice to remedy imbalances of demand and capacity.

The Permanent Commission stressed the urgency of carrying out the work mentioned in the two preceding paragraphs and called for a progress report at its November meeting.

The Permanent Commission endorsed the Agency's Five-Year Programme 1989-1993 which is based on an average growth in real terms by 10 %.


TO PALMA?
YES, LET HIM GO, SO
AS TO CROSS CTL BETWEEN
01⁰⁰ AND 01¹⁵ THURSDAY NIGHT
IN TWO WEEKS......
FLOW CONTROL

FLYING THE B-17

by Philippe Domogala

Yes, at the end of 1987 there is still one B17 Flying Fortress used for commercial work and certified to carry passengers!

After the last 2 B17 Freighters used by FRIGORIFICO REYES in Bolivia (note 1) to carry meat from the lowlands to La Paz were dismantled in 1983 and the last of the 7 B17-Tankers used in the United States as fire-fighting aeroplanes was grounded in 1986 (note 2), we believe that F-BEEA ("Echo Alfa" for the intimates) is the only Flying Fortress left in commercial use in the world today.

"Echo Alfa" is still used around 150 hours a year by the INSTITUT GEOGRAPHIQUE NATIONAL (IGN) in France, for photographic and (mainly) for Electromagnetic Teledetection (sort of Radar-generated "photographs").

"Echo Alfa" is the last one remaining of a onetime 14 strong fleet of B17's, the IGN owned.

In August 1987 I had the privilege to make a flight on Echo Alfa. It was a 4 hours Teledetection calibration flight, for a new antenna of the VARAN-S type (we will come back to the characteristics later).

On behalf of the CNES (CENTRE NATIONAL D'ETUDES SPATIALES) the French Space Agency.

The Flight was due to depart at Noon, from IGN home base in CREIL (an airport 30 miles North of Paris). The planned Altitude was 19 to 25.000 feet, on various predetermined axis around BEAUVAIS (another airfield 50 miles North of Paris) before returning to CREIL.

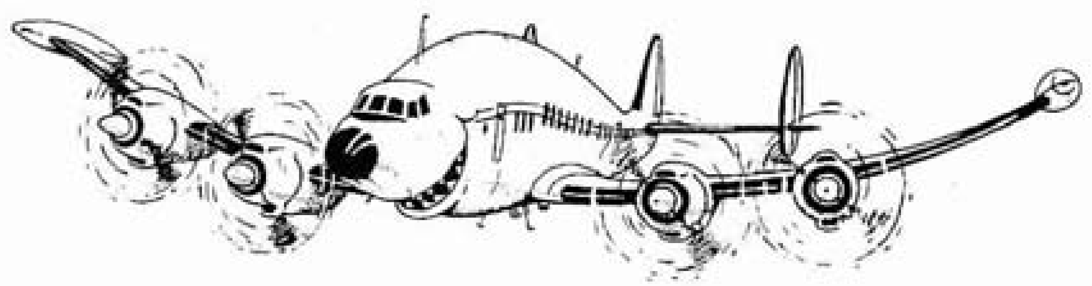
Unfortunately the weather was not summer-like at all: low clouds, rain and a mere 13 C (55 F).

Upon arrival in CREIL round 11 a.m. we are met by Capt. ARNOULD the Deputy head of Operations who introduce us to the crew: Capt. FRANCOIS and Capt. TARDIEU, and we all go to the Airfield's canteen for a simple but very nice lunch before the flight.

Engineers of the CNES are still busy installing the equipment on board the aircraft... it will take some more time, maybe another hour we are told, because of some last minute difficulties with the inertial platform sustaining the antenna.

The Fortress now stand in front of the Hangar: incredible aircraft.

This model is the last one of an impressive series: a total of 8690 B17 were build during the war. It was a Boeing design (Boeing 299 model) which first flew in 1935. But Boeing only built about 4000, the rest was built under licence by various companies like Douglass, Lockheed, Yega etc ... Our particular aircraft was built by Lockheed in 1945, its production number is 8552, so it is among the last ones built. (note 3)



She was stocked by the US Air Force and sold to the IGN in December 1947 together with 2 other B17's. These 3 aircraft were the first B17's the IGN received.

"Echo Alfa" made her first revenue flight in June 1948, it was a photographic mission in the south of France, on the Mount VENTOUX. Then she made numerous missions in Africa in the 50's. Among the most interesting mission this particular aircraft made was the discovery of oil fields in Sahara (then French Algeria) using a then ultra-secret technique called "MAGNETOMETRY" where a plastic "bird" containing a huge sort of "compass" was towed beneath the aircraft on a 200 feet cable in order to note any tiny variations in the Earth's magnetic field. Where abnormal magnetic variation existed one was expected to find beds and layers of iron or beneath the surface. They found oil instead...

In 1962 "Echo Alfa" was used for the film "Dr. Strangelove" with Peter Sellers. All of the "Siberian" shots were taken above Canada and Greenland using her. All the airborne shots were done from the B17, bombing bays etc... If you watch the movie again you will note that the shadow of the aircraft on the ice is that of a B17 and not of a B52.

Since 1973 "Echo Alfa" is used extensively for high Altitude Teledetection. The B17 is perfect for this: it can fly at low speeds (140 kts) at very high altitudes (up to 30,000 feet) and because it is not pressurized one can easily cut "holes" in the hull to accommodate various cameras or antennas of all shapes.. It can also carry 3,5 tons of equipment for more than 10 hours.

But "Echo Alfa" is not the most anecdotist aircraft the IGN had by any standard. The record was held by sister F-BGSH, ex "shoo-shoobaby" from the war. The aircraft had an impressive military and civil career when it joined the IGN in 1955.
Built in 1944 by Boeing-Seattle, the aircraft served the USAF with its 91st bombing group based in Bassingbourn in the UK. The aircraft made 26 war bombing missions before being forced down on 29 May 1944: The story is fantastic: "shoo-shoobaby" first lost no 3 engine, because of a overheating turbocharger on its way to the target, which was POZNAN in Poland, and could not feather the propellers, which turned like a windmill. Our aircraft could not maintain speed nor high altitude but continued below and behind the rest of the Formation. She delivered her bombs on target, made a large turn to return to England.

The other B17's were attacked by German Folke-Wulfs and Flack but all missed our aircraft that was well below and behind the group. When passing the coastline of the Baltic Sea no 2 engine stopped. They could not maintain level flight, the crew jettisonned everything that could yet loose overboard: machine guns, ammunitions, radio racks, etc... but they kept loosing altitude, so the pilot-in-command, Lt. Bob Gunther, realizing they would never reach England, decided to "divert" to neutral Sweden. When reaching the Sweedish coast, our aircraft was welcomed by a little Flak, then forced down by an interceptor into Bulltofta near Malmö. On touch down no 4 engine stopped and they almost collide with a B24. The crew is arrested (but released 5 months later) and the aircraft impounded.

In May 1945, at the end of the war, the US Government gave a few B17's officially to SWEDEN. "Shoo-shoobaby" was among those: the aircraft was transformed by SAAB into a passenger aircraft and received registration SE-BAP. A few months later she was sold to the Danish Airlines (DDL) and became OY-DFA. Carrying 14 passengers, 5 crew and 2 tons of freight, our B17 was used on the route Copenhagen-Cairo-Nairobi until May 1948. It was then sold to the Danish Air Force which used it for the photographic survey of Greenland. In 1953 the aircraft was used intensively as relief-cargo-aircraft between Copenhagen and Amsterdam following the Dutch dramatic floods that year. In 1955 our B17 was sold to the IGN, which used it for various photographic missions, specially in Lebanon and in Madagascar. It stopped flying in 1967, and was then used for spares for the other B17's of IGN.

In 1971, the IGN gave the relic to the 512th Antique Aircraft Restoration

Group, USAF Dover, which cut the aircraft neatly, transported it by truck to Wiesbaden (W-Germany), loaded it in a C5-A Galaxy bound for WRIGHT-PATTERSON Airbase (Ohio) - home of the USAF Museum. "Shoo-shoobaby" was restored to her former war colours and now stand proudly at the Museum's entrance.

But back to "Echo Alfa". It is now 14.00 and the technicians are almost ready. Mr. ARNOULD comes with a box and gives us our oxygen masks.. as we saw, the aircraft is not pressurized, and when above 15.000 feet everybody should wear an oxygen mask around his neck and use it from time to time, and above 19.000 feet, has to wear it permanently.

The crew is one pilot, one flight engineer (also a pilot) and one navigator, located in the glass nose, for precision navigation, a prerequisite for all IGN missions.

I took place on the old "Radio Station" just behind the pilot. The pre-flight checks were started. It reminds me of old war movies, prior to a raid above Germany. Most of the instruments are original ones, including a radio-valve (lamp) operated auto-pilot, which need constant tuning but still works perfectly. The only noticeable "new" instruments are a VOR/DME/ADF receiver and an encoding altimeter. Behind the flight engineer seat (yes behind, there was o other space available) is a "new" rack where the ? sets of navigation and communication sets and the SSR Transponder are located, forcing the pilot to turn over facing the back of the aeroplane every time a frequency change is needed...

At 15.00 the first Wright-Cyclone 9 cylinder piston engine burst to life leaving half the format covered with white smoke (normal with radial engines) after the first out of sequence explosions and the accident oil burned, the engine roar nicely, stabilized at 1200 RPM.,.... smokeless...number 2...All 4 engines start without problems. Synchronisation...ok.. No extraordinary vibrations... A sudden high pitch winning noise fills the cockpit...what's that?....Ah! the hydraulic pumps...

The tractor pulls away the ground electric generator...the chocks are taken away... Thumbs up everywhere around us...we taxi...Tail-down aeroplane means visibility on the ground in front of you equals NIL!... The captain has to constantly pock from one side to the other... I would not like to taxi an aircraft of the size on those small taxi-ways...everything has to be done by the brakes. like with a Jodel or a Tiger-moth...

We approach the runway... which side to take? CREIL is now an unused Air Force Base with no Air Traffic Control Operations tell us the spot wind is 350 8 kts, so we choose runway 25. Take-off clearance is asked by telephone from IGN Operations to

Charles de Gaulle-Roissy Airport (10 miles away)...On the threshold we run-up the engines one by one...3000 RPM, pressures, temperatures, OK, reductions ... electric checks ... we receive our departure-clearance...

"Runway 25, take off, SH departure, transponder on A3746 to contact Roisy Approach on 124.35 after departure, the wind in Roissy is 360 with 6 knots, QNH is 1007..."

We line up.. Captain ask his flight-engineer-co-pilot: "You will do the engine re ctions yourself...we weight 22 tons...OK? Temperatures and pressures are OK? The tail-wheel is locked. ...

Full power...2500 RP ' on the 4 engines, 46 inches turbocharger inlet pressure.. brakes released... "Here we go!"... 1200 HP per engine aer oose-... 80 MPH, 120 MPH, tail up and we lift off! (note 4)

We are airborne... 135 MPH climbing speed reached...easy on the throttles... 2300 RPM, turbo reduced to 38 inches... Rate of climb stabilized at 500 ft/minute.. We contact Roissy Approach: "Radar contact, clear to climb to flight level 190 (19.000 feet) direct to Beauvais..." (our first axis). Excellent cooperation from Air Traffic Control as usual... We start to relax... we enter the low stratus clouds and the rain stops... we leave the clouds to find ourselves below another layer of grey cumulus some 10.000 feet above...on top of those a thick layer of alto stratus hides the sun...

We won"t need our sunglasses today I'm afraid...

We pass 14.000 feet and everybody start adjusting his oxygen mask. There are the old models with 2 non-elastic strips which take ages to adjust properly...testing 100% ...OK. Normal OK. the blinker in front of you reminds you when to breathe (almost).

We now arrive at our first cruising altitude... Cruising power is set at 2200 RPM's, turbo on 28 inches. We now use 800 liters (180 UK gallons) of fuel per hour... we could stay here all day if we wanted... (in a ferry configuration the B17 has over 16 hours of autonomy).

The technicians and engineers on the back are starting their work..The antenna is a cylinder type array, fixed on an inertial platform so a to have always the same orientation relative to the ground, despite the movements of the aircraft. It is fixed on a bomb-bay with a plastic random under it an accessible from the top by the technicians.

The very high frequency used (9.3 GHZ) makes this radar unaffected by weather, rain etc. and this microwave remote sensing radar allow a definition that, electronically processed, can produce photography-like images. It can also be tuned to detect height of grass or crops from the ground, and be a very valuable agricultural tool in the future...

The potential of this type of radar is infinite... The CNES intent to put one on orbit in a future satellite for agricultural survey... (see picture)

And testing this technology is done here, .. on board a 1945 aeroplane.. The large hole on the hull needed to operate the antenna, and its access in flight by technicians make the B17 the only possible aircraft available at the moment.

By now everybody on the aircraft is very busy. The technicians tuning the equipment, the flight engineers tuning the engines and taking notes of each parameter on the technical log. The navigator correcting all the time the headings, and sending instruction to the pilot, by now flying on "manual". The axis must be very precise...

And all this crowd wearing green oxygen masks and long ombilical hoses behind them, a bit like cosmonauts...

And this is going to last for a few hours....

After 3 hours of flight... suddenly ice forms rapidly on the engine intakes... then on the wings... the captain, very wisely decide to interrupt the mission and to descend immediately to a safer altitude...

During the descent loud "Bangs!" are heard... these are pieces of ice getting loose from the superstructures and which hit other parts of the aeroplane... Bang! another one hit the cockpit just above the window, it makes a dent in the aluminum and the dark green interior paint falls off... geee!..it is not a joke... we enter the stratus...the rain starts... visibility is down to NIL...

The captain decides to go back to

CAVIL, and land.
With the rain, the ice is disappearing fast fortunately... we continue our descent 160 MPH ... "We'll make a no-flaps landing..." OK...
3000 Feet - still IMC (in clouds), suddenly at 2500 feet we spot the ground... relief!... The runway is to our right. A small electri switch is touched... the gear is lowered... The runway is coming fast... we pass the threshold, we start to rotate... and loose sight of the runway.... as we touch down... the captain has to look on the side-window to make sure we stay on the runway. Difficult to adept to a tail-wheel aircraft nowadays...

Number 3 engine is vibrating unusually, the flight engineer decide to shut it off precautionary, so we taxi back to the hangar on 3 engines ... After a final checklist we stop "Echo Alfa" with her nose in front of her hangar doors... the 3 remaining engines are shut... sudden silence.

We take our oxygens masks off, strop ourselves out of the seats and disembark the aircraft via the small "round hatch" just below the cockpit: a bit of gymnastic is needed there - you hold the frame with your hands above your head, let yourself down, and let the hands go when your feet hang loose 2 feet above the ground!... Feet on the tarmac... rain again... to find 2 ground engineers looking at me with astonishing faces...
We immediately understand why... Nr. 3 engine is covered with oil - the right landing gear beneath is black from oil... A cylinder bursted... probably hours ago... we never noticed... how come? I ask... Well, this is war technology I am told... As long as the engine is warm the parts will continue to turn. You can loose cylinders without significant loss of power, but once it stops, the engine colls and seize... you've had it...

We now leave "Echo Alfa" with regrets... we go back to the Operations building where everybody has to file his report... half an hour later everybody meets in the "OPS BAR", a reminder of the Air Force customs... Where in every squadron in France, somewhere behind a hangar there is a hidden "illegal" bar where everybody meets... This one is not different, on the basement... After a time everybody involved with this mission, the crew, the CNES Technicians, the OPS director and ourselves are having a drink, while exchanging impressions and experiences.... Experience .. yes .. It has been a fantastic one for me at least... and probably not to be repeated again....
In Mid 1988 "Echo Alfa" will probably be replaced by a ..... Fokker F27 Friendship, presently being specially modified by UTA in Le Bourget...

What a pity!.. A complete era of aviation will disappear... Of course the noises of the Cyclones' 9 cylinders will still be heard on air-shows for a while, as long as enthusiasts in UK, France and the US will spend a fortune maintaining airworthing a handful of B17's for 10 to 20 hours a year... but is is definitively not the same.....

The author wish to thank the IGN and especially MR. ROY, director OPS, Mr. ARNOUD, deputy, Mme COTTE, Public Relations and MR. FAIVRE, technical director for their help in producing this article...

note (1) : B17E CP-1076 and B17G CP.891
note (2) : B17F N17W of Globe Air inc. in Arizona (built in 1942!)
note (3) : its serial number is 448, 564.3 dated 1945 (no day-month)
note (4) : The B17 is an aircraft that you take off on "3 points", that is that the tail-wheel and the main gear should leave the ground simultaneously...

A LIPPE RADAR VETERAN LOOKS BACK

——by Paul Demelinne ——

It is an irrefutable axiom that even in a hi-tech environment like the Maastricht UAC, nothing can be accomplished without the joint efforts and cohesion of the individuals employed here. Respect, understanding, consultation and appreciation are not only human interest/professional-, but also rudimental conceptions, which, right across origin and community, determine the successful functioning of an international community. LIPPE RADAR veteran Hauptman Helmut Gramsch (48) has experienced something or other in a rather agreeable sense during his tour of duty at Maastricht. An assignment covering the years 1975-1988, in which period Helmut and his wife Angelika watched their daughters Silke and Ann-Kristin grow up to become young, independent adults. The fascination of an international organisation even urged Silke to commence a professional career with the Department of Foreign Affairs of the Federal Republic of Germany.

During the interview which INPUT conducted with the departing supervisor of team 4, Helmut Gramsch concluded: "The decision to move Lippe Radar from Goch to the technical highly sophisticated Maastricht UAC establishment, proves its positive impact day in, day out...".

Hospitality is written in capital characters at the Gramsch residence in Munstergeleen, during a sunny Thursday morning in July. Your INPUT representative is welcomed by the delightful aroma of fresh herbal tea and a superb breakfast-dish, consisting of typical German delicacies. Whilst enjoying the good things of life, Helmut unveils relevant parts of his pre-Maastricht UAC curriculum vitae.

Born in Prague, growing up in Munich, Helmut's favourite youth dream of becoming a train engineer did not deviate much from that of the average boy. Upon completion of the school education years, his first employer was indeed the BUNDESBAHN (German Railway Company), but in a slightly different activity: that of a (train) traffic controller. "A very demanding job with frequent night duties," Helmut recalls. When drafted into the military service, Helmut Gramsch found himself in 1963 at the operations desk of a transport squadron (Nordatlas) in Alhorn. There his attention was drawn to a publication, offering an officer's career in ATC with the Luftwaffe. He applied successfully. A hectic period consisting of training programmes, various courses and temporary assignments followed, with much constraint for the engaged couple Helmut and Angelika, who sometimes had to cross West Germany by all points of the compass, in order to spend a few moments together. Life became more placid once they settled down at Goch, where Helmut Gramsch joined the Lippe Radar team, around 1968.

Helmut: "As years progressed, it became obvious that the system used at Goch, got out of date and was due for replacement. Creating a new concept was a very expensive, time consuming affair. During deliberations the option of using surplus capacity at the ultra-modern Maastricht Control Centre of EUROCONTROL, was given some serious thought. The definitive choice for Maastricht was, after all, rounded off surprisingly fast; in my opinion partly due to political considerations. Personally I considered it to be an interesting development. I still remember our first wondering reaction: "Maastricht, where is that place situated"? Being abroad, it was a voluntary assignment, which nevertheless appealed to us, keeping in mind that some of my former colleagues transferred to civilian posts at Eurocontrol. "Soon after, Maastricht UAC controllers came to Goch on temporary duty as part of the agreement. The workload waiting for us was enormous. Transition to a completely new system requires a lot of studying, training, check-outs, working out agreements, and what have you"?

In the course of 1975, the quarter masters appeared on the Maastricht UAC premises around August, followed by the first group of administrative and operational personnel, amongst them Helmut Gramsch. Looking back on that period, Helmut remembers: "The operation was a fairly smooth one because it was conducted under supervision of Lt. Col. Stieglitz, a commanding officer with excellent management qualities and diplomatic talents".

In those early days one could say that there was a certain amount of restraint towards the civilian colleagues in the Operations Room. "A logical attitude, based on experience gathered at Goch with the BFS controllers. Coordination and cooperation did not go on wheels in those days. A well-known fact, which should not be hidden away. In Maastricht, however, we entered a completely different world. Dominated by a positive atmosphere, the willingness to sit around the table and learn from each other, was advocated. The ice was rapidly broken".

Many years of experience put Helmut Gramsch in a position to compare the Eurocontrol module with a national concept of handling ATC: "In my honest opinion I think that the BFS is way behind, looking at the matter from a technical approach. Besides that, young creative employees have hardly anything to say and are poorly remunerated for a very responsible, demanding job - demotivating circumstances which only widen the already existing gap. I find it inconceivable that the member states of Eurocontrol make so little use of the gigantic potential and renovating prospects, the organisation has to offer. The ignorance of many in the world of aviation is substantial, caused by the obligation of Eurocontrol to keep a low profile towards publicity. Let's hope that the present crisis will open the eyes of the responsible authorities. I am convinced that a limited number of ATC stations, rigged as the Maastricht UAC, could smoothly absorb the traffic expansion".

"As from the military point of view, I can only judge in an enthusiastic way. The sublime MADAP system makes it even superfluous to sit side-by-side with the civilian controller. We receive identical informa-

Farewell party with his Lippe Radar comrades tion, look at the same radar picture and simply press a direct-access key to coordinate. The available capacity supersedes our requirements by far, whether it concerns major exercises with high traffic density, or more specific tasks such as special treatment flights, radar surveillance flights, exceptional routeings and so on. Such services were not possible to this extent, during the Goch era. It goes without saying that LIPPE RADAR nowadays serves as an exemplary establishment for other military ATC units at any level".

"The years we spent in the Limburg region have been excellent", Helmut Gramsch says. "We were very impressed by the way our neighbours have accepted and introduced us into their community. As German natives, one feels still somewhat precarious because of the past, but here we felt at home in no time. Dutch people, and especially the Limburgers in general, are - in a natural context - tolerant and open towards alien newcomers. Within the Eurocontrol community we really enjoyed the dance nights, rallies, sports days and other activities. It is of extreme importance that these social aspects are further intensified in joint efforts by the military and civilian components. Personally I spent a lot of gratifying hours with the Eurocontrol volleybal group on Monday nights. Ambition to reach for the top was not at stake here, but merely the pleasure of enjoying together the game in a relaxed atmosphere. Moreover, the four of us had great times sailing the IJsselmeer or cycling through the beautiful Limburg scenery". At this point Helmut Gramsch advocates longer assignments for military personnel; a plea strengthened by sensible argumentation: "Continuous rotation in the

"Lippe Radar nowadays serves as an exemplary establishment for other military ATC units at any level."

military service at RELATIVELY SHORT INTERVALS has become merely a traditional occurrence rather than a meaningful necessity. On reaching the moment when one has acquired sufficient training and routine to function properly, the obligatory transfer emerges on the horizon. In this context it is hardly feasible that maximum productivity is gained over a reasonable length of time. Proficiency has to give way to a new cycle of training and qualifying. I realise perfectly well that rotating assignments are an integral part of the military profession - I moved about 10 times since I joined - however, the time-elapse is often too short. I admit that I have been fortunate to stay at this post for 13 consecutive years, but do not forget that there was never more certainty for us than a period of 3 years. This is a burden to yourself and your family, because one simply cannot enjoy everything fully, or plan over longer terms".

Incidentally, it should not go unrecorded that Helmut Gramsch served during his entire tour of duty as a licensed (voluntary) examiner for the 'Deutsche Sportabzeichen', a nation-wide, very popular fitness programme, involving amongst others, running and swimming. Having passed the test himself for no less than 25 years in a row, many fellow-countrymen annually submitted their physical state of affairs to the critical judgement of Helmut Gramsch. His most distinguished candidate through the years has been Dr. von Villiez, Director of the Maastricht UAC. "A man whom I hold in high esteem, because he managed to achieve the gold medal already 15 times", Helmut Gramsch remarked.

Helmut Gramsch has five years to go in active service, before he retires. On August 1st, he commenced duties at STETTEN APPROACH. "Stetten Approach is a brandnew project for the German Airforce. Our task is to extend this new establishment into a workable unit, which will ultimately become an integral part of a new joint civil-military ATC centre at LANGEN, planned to open somewhere in the next decade. Langen will take over all ATC tasks in the busy Frankfort area. A lot of spadework lies ahead, during which I will certainly recall frequently, the pleasant years at Lippe Radar in the Maastricht UAC".


DUE TO THE DELAY I THINK WE HAVE A PROBLEM, CAPTAIN...

THE "COMPAS" SYSTEM

THE COMPAS-SYSTEM - COMPUTER ASSISTED SEQUENCING AND SCHEDULING IN AIR TRAFFIC CONTROL

Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt (DFVLR) Institut für Flugführung, Flughafen, D-3300 Braunschweig, Germany.

ATC 2000 SEMINAR 23-24-25 February 1988 Eurocontrol Institute Luxembourg.

*
by Adam U. Völckers
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1. Introduction

Planning and control of a safe, regular and efficient flow of air traffic at high density airports is an extremely difficult task for Air Traffic Control (ATC). The increasing number of additional requirements that have to be met by ATC, such as: fuel efficiency, noise abatement procedures, wake vortex separation, capacity usage demands have made this task even more complex and challenging.

In a joint project carried out by DFVLR and BFS (the German Federal Administration of Air Navigation Services) the COMPAS-System (Computer Oriented Metering Planning and Advisory System) has been developed, tested and evaluated at DFVLR.

The operational objectives of the COMPAS-system are (with regard to Frankfurt Airport) to achieve best possible usage of the available, but limited runway landing capacity, to avoid unnecessary delays and to apply economic approach profiles whenever possible. The planning functions, which nowadays are still carried out by human controllers, will be performed by a computer. it generates and suggests a comprehensive plan for a best overall arrival sequence and schedule. The execution of this plan, however, intentionally remains the task of the human controllers. They are therefore provided with all necessary data for the control of approaching aircraft.

The objective of the project was to find solutions and to get experience in the design and application of computer assisted systems in Air Traffic Control.

The design of a semi-automated subsystem necessitates in particular careful and feasible solutions both for the transfer of human planning and decision making functions to a computer as well as for the distribution of authority between computer and controller.

2. Arrival Planning in Air Traffic Control

2.1 Human Planning in todays system

An important task in Air Traffic Control is to merge several converging streams of aircraft from different approach directions on the runway centerline. On major, often congested airports this is a challenging and complex task. Although the average arrival rate may not exceed the average landing capacity, it cannot be avoided that (despite all long-term flight plan coordination and medium-term flow control) the arrivals are randomly distributed.

This may lead to:

- arrival peak (resulting in delays);
- arrival gaps (resulting in unused capacity);
- ineffective wake turbulence sequencing (reduction of capacity);

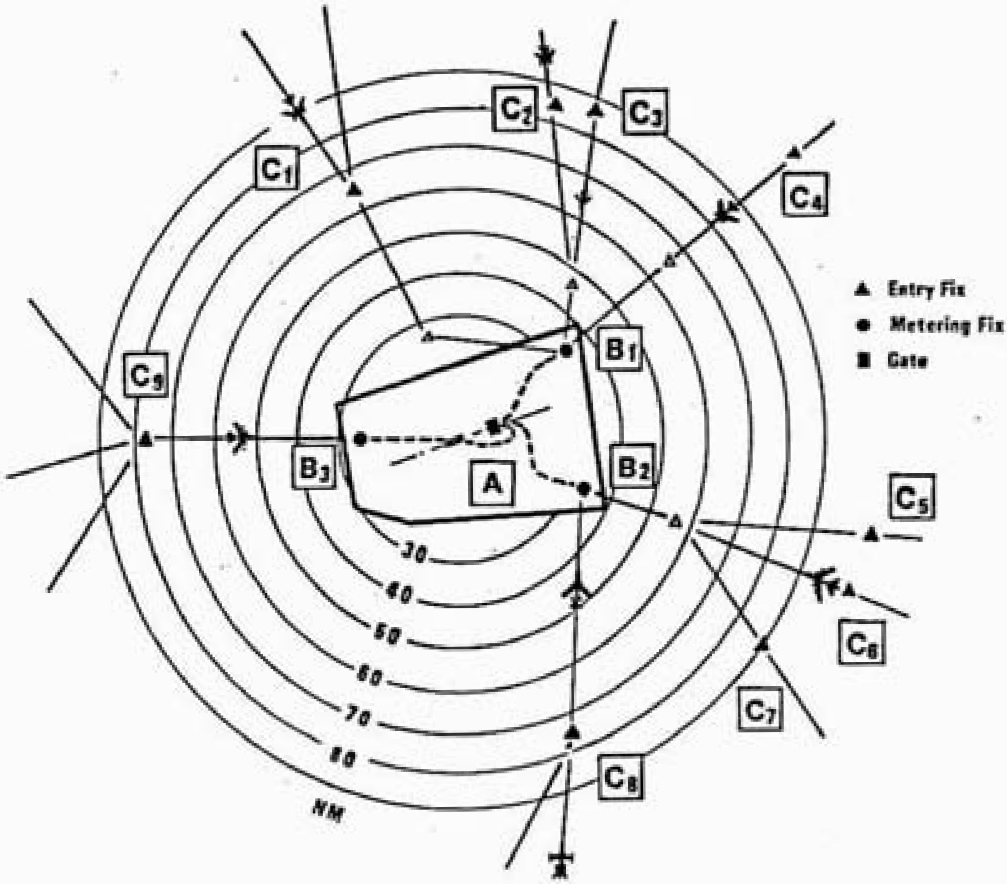


Fig. 1 Airspace structure of the Frankfurt Approach Area

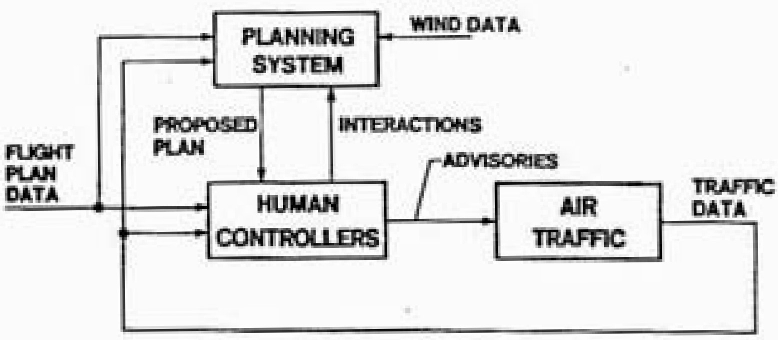


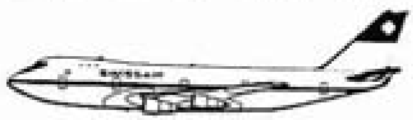
Fig. 2 Integration of COMPAS into the control process

- uneconomic flight profiles,

if no appropriate planning and control actions would be taken by air traffic controllers in order to establish a safe, smooth and efficient flow of traffic. The actions should be taken in time outside the terminal area, to avoid congestion and holding procedures in the narrow terminal area, and to allow the application of economic, idle-descent profiles.

Fig.1 illustrates in a schematic way the extended approach area of Frankfurt Airport. A typical approach begins in the vicinity of a so-called "Entry Fix" some 70-100 NM from the airport at flight levels between 150 and 280. The different Standard Arrival Routes are converging at three Main Navigation Aids the so-called "Metering-Fixes".

The intermediate approach legs from those three directions are finally merging on the extended runway centerline. Normally the landing sequence should be established at least some 10 NM from the runway



threshold. This assumed point is called "Gate".

Today the arrival planning and control process is performed by several control units, some of them are assigned to the Area Control Centre (units C_i and B_i) others to Approach Control and Local Control (A_i).

The shortcomings of todays situation can be described as follows:

- The overall planning task is distributed to several control units.
- Arrival planning is performed "stepwise" from the "outer" units (C_i to B_i) to the "inner" units (A_i).
- Some kind of tactical planning prevails in each control unit and must be coordinated with other units.
- The application of one overall planning criterion and agreed control actions is very difficult to achieve, because of the high coordination effort.
- The integration of a variety of data from many different sources has to be performed mainly in the head of the human controllers.

This leads to an extremely high workload and even small disturbances, which can not fully be matched, may result in a traffic congestion. Splitting-up and distributing this task to more control units would require even more coordination effort. Therefore it was envisaged to transfer at least some parts of the human planning and control functions to a computer.

2.2 Computer-Based Arrival Planning

Based upon studies at Frankfurt Airport, a concept for a computer based planning system (COMPAS), aiming to assist controllers in the comprehensive planning of arriving aircraft was developed, tested and evaluated by the DFVLR Institute for Flight Guidance in cooperation with BFS.

The essential design principles of the COMPAS-system can be described as follows:

- The stepwise distributed arrival

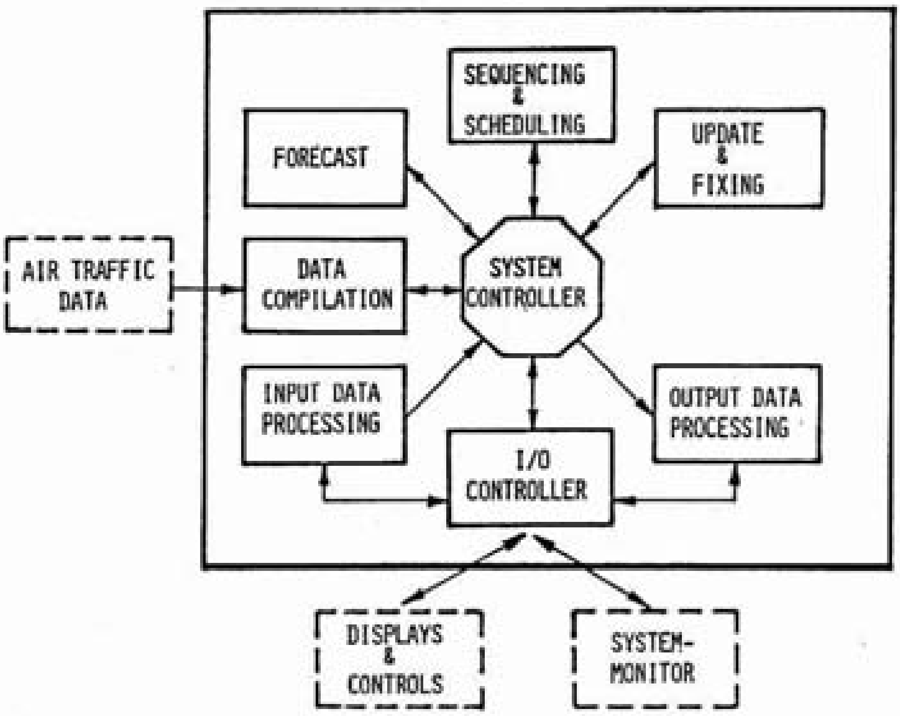


Fig. 3 COMPAS data processing functions

CONTINUOUSLY/AUTOMATICALLY

- o SEQUENCING & SCHEDULING
- o METERING CONTROL ADVICE
  (SPEED, DESCENT, FLIGHT PATH RECOMMENDATIONS)
- o ADDITIONAL INFORMATION (DISPLAYED ON REQUEST)

BY CONTROLLER INTERACTION

- o CHANGE OF NOMINAL SEPARATION
- o CHANGE OF LANDING DIRECTION
- o CHANGE OF ATC/AIRSPACE STRUCTURE
- o CHANGE OF SEQUENCE
- o INSERTION OF ARRIVALS INTO QUEUE
- o EXTRACTION OF ARRIVALS OUT OF QUEUE
- o EXCEPTIONAL CASES AND PROCEDURES

Table 1 COMPAS-operational capabilities

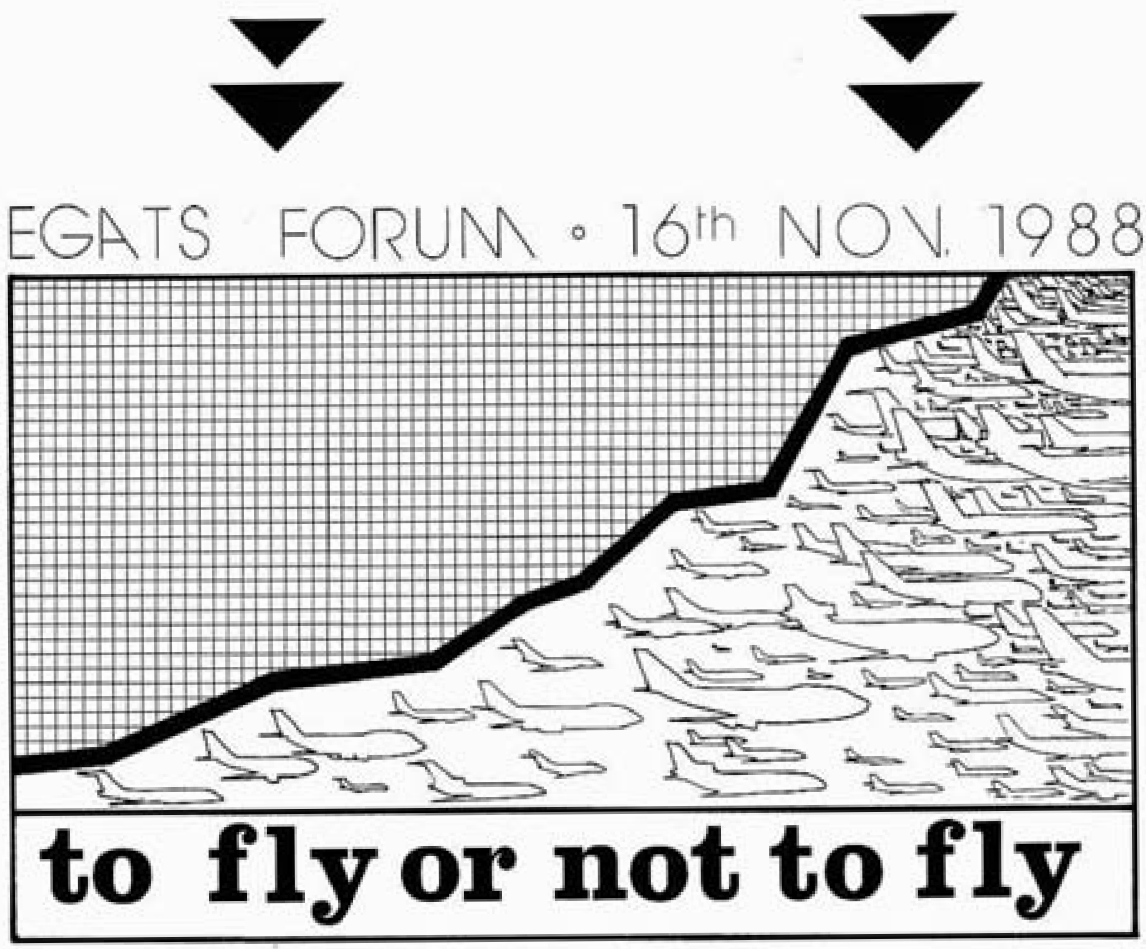
planning of the controllers is substituted by a single comprehensive computer based planning system.

- The computer planning function anticipates the traffic development for the next 30 minutes and uses one common criterion for all units.
- Besides radar tracking and flight plan data, many additional data are included in the computer planning functions, (i.e. traffic load in sub-sectors, aircraft performance and economy, actual airspace structure, wind data, etc...). The computer integrates these data and generates an overall plan.
- Each control unit involved is provided with its respective planning results, necessary to perform its task in the system.
- The controllers stay fully in the loop and keep their executive function. In general the computer generated plan is acceptable to the controllers. However, it is possible for the controllers to interact with the computer in order to modify the plan.

The operational objectives of the COMPAS-system are with regard to the Frankfurt situation:

- best usage of runway landing capacity;
- delay reduction for arrivals;
- application of economic descent profiles, if possible.

Fig. 2 shows how COMPAS will be integrated into the ATC-environment. Based on actual radar data, flight plan data and wind data and taking into account additional information COMPAS generates a plan and displays it to the controllers. The controller may use these COMPAS-proposals, but is not obliged to use the system. However, if he does work with it, the results should be so reasonable and convincing, that he easily can adopt these proposals for his control actions. Under normal conditions no controller-computer interaction should be required. However, interaction is possible, if the controller wants to modify the plan or if it is necessary to cope with unforeseen events.



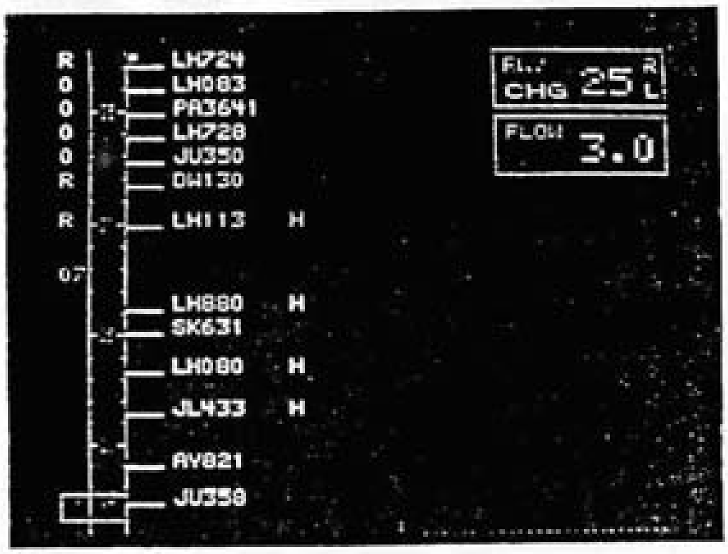


Fig. 4 COMPAS-display format for APP control

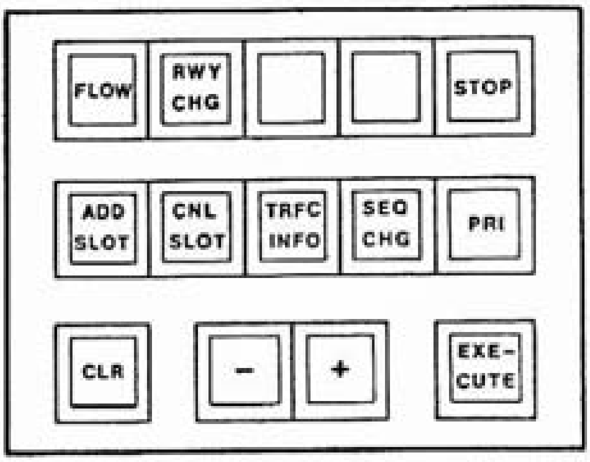


Fig. 5 COMPAS-functions keyboard

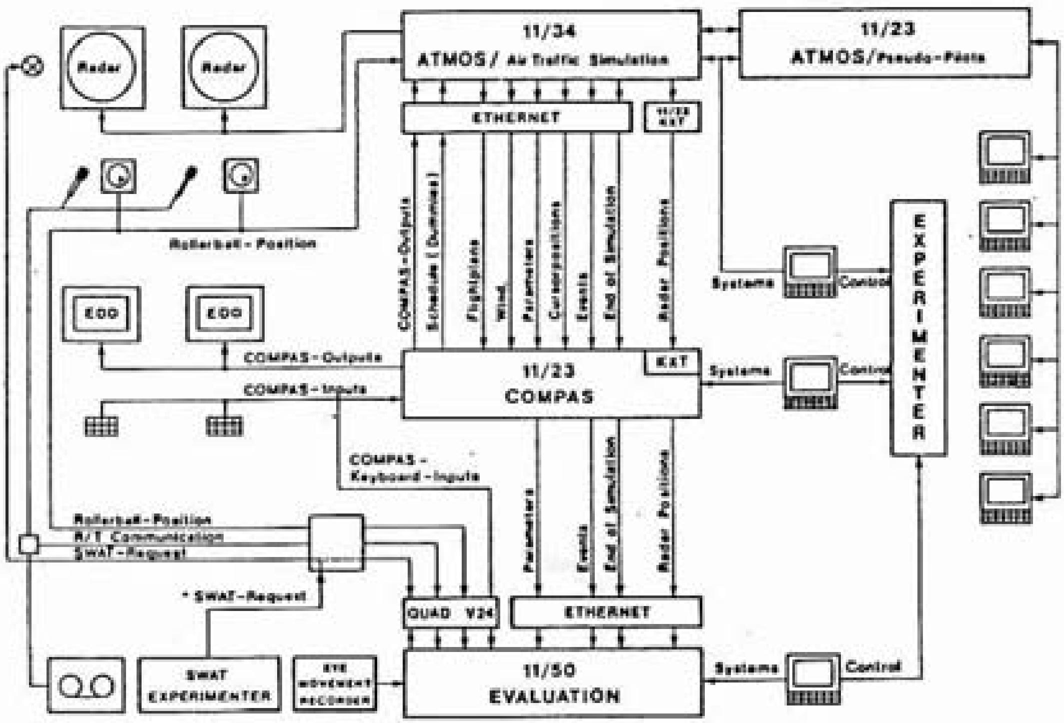


Fig. 6 Experimental system ATMOS/COMPAS

An overview on the various sub-tasks which have to be performed for the planning is listed below. Most of them can be regarded as "auxiliary" functions for the main planning task: the sequencing and scheduling.

- System monitoring and control
  . Automated DP-controller
  . Pre-processing of inputs for the modification of baseline data
  . Processing of DP-errors
- Data Compilation
  . Radar target recognition, extraction
  . Flight plan data selection
  . Code/Callsign assignment
  . File inauguration and data procurement
- Data-Base-Management
  . Storage, modification and provision of the valid airspace structure, landing direction, landing rate, separation, type-specific performance, profiles, wind models, etc...

3.2 The Planning Algorithm

The core of the arrival planning function is an algorithm which consists of three major elements:

- Prediction and initial scheduling
- Time-conflict detection
- Time-conflict resolution

- Forecast
  . Speed calculation from radar tracking data
  . Flight path assessment
  . Time-to-fly calculation
  . Arrival time prediction
- Sequencing and Scheduling
  . Merging of new arrivals into existing sequence and schedule
  . Time-conflict detection
  . Time-conflict resolution with "Branch & Bound" algorithm
- Update and Fixing
  . Update of sequence and schedule
  . Assessment of final sequence
  . Release of unnecessary "time-tension"
  . "Freezing" of final schedule and sequence
- Input/Output Control
  . Controller-Computer-Interaction procedures
- Input-Processing
  . Processing of controller modifications
  . Processing and storage of parameter alterations
- Output-Processing
  . Continuous processing and display of results
  . Processing and display of data on request

When a new aircraft arrives at an "Entry Fix", the arrival time prediction is initiated and two different arrival times for the "Gate" are calculated:

- The Estimated Time Over Gate (ETOGT) based upon the preferential profile (i.e. idle thrust descent) and all other actual data of the flight.
- The Estimated Earliest Time Over Gate (EETOGT) taking into account all measures to speed up the arrival within the performance margin of the aircraft and utilising possible short-cuts of the flight path.

The "earliest" arrival time is used for the initial planning in order to keep the system under "time pressure" and to advance and expedite the traffic flow. With its EETOGT a new aircraft is inserted into the existing aircraft sequence and schedule for the Gate. The result is the initial plan, giving a tentative schedule and landing order. Then the time-conflict detecting function is called.

The time-conflict detector is searching the entire landing order for infringements of the minimum permitted time-separation between any pair of

two succe..sive aircraft at the Gate.

It uses a data table, the so-called separation matrix which gives the minimum permitted time-separation between any combination of leading and trailing aircraft according to their wake-vortex-class.

If there is no time-conflict between two or more aircraft detected, the conflict resolution function comes into effect.

The time-conflict resolution algorithm is governed by the strategy to minimise the total aircraft delay time, according to the overall goal of the COMPAS-system, to maximise the aircraft throughput. Other strategies are thinkable, e.g. to minimise the total number of time-conflicts to be resolved, thus reducing controller workload.

4. Computer-Controller Interface

The proper design of the man-machine interface is very crucial for the practicability and acceptance of a computer assisted function. The guidelines for the layout of the COMPAS-system have been:

- to keep the controller in the loop, i.e. to give him the plan, but to use his experience, skill and flexibility for the verification of the plan;
- to display just the necessary data, in a clear and understandable form;
- to minimise the need for keyboard entries.

These user requirements led to problems and respective solutions concerning the

- distribution of authority between controller and computer
- design of displays and controls and operational procedures.

4.1 Distribution of Authority between Controller and Computer

The requirement to keep the controller in the loop led to a solution, where the automated planner works in parallel to the controller (Fig. 2). This means that the control authority fully remains with the controllers. The computer simply takes over the complex planning task and makes proposals to the controllers. Assuming that these proposals are compatible with the intentions of the controller and the ability of the aircraft, the controllers will readily accept the suggested plan, convert it into appropriate control advisories, which then are transmitted to the aircraft. The traffic situation will then develop further as anticipated by the automated planner. Since the controller does not "inform" the computer about his control actions, the computer does not get a direct feedback from the controllers, but recalculates the plan based on the actual development of the traffic situation. Only if interactions occur, the computer will directly react to controller inputs.

The planning function can be classified as "loose, open loop-planning". with - by intention - low accuracy, leaving much responsibility but also flexibility to the human controllers.

Other concepts with a more "tight, closed-loop-planning", are conceivable, however, they require even more data, more data-processing capability, more intelligent algorithms and a higher degree of automation.

In real world operation, however, deviations and disturbances frequently occur and have also to be dealt with. This means if the controller has to maintain full control authority, he must be permitted and able to "override" or modify the computer generated plan. In the COMPAS-system this can be done utilising some function keys. Table 1 shows the operational functions of the COMPAS-system which are continuously available or can be initiated by controller interaction.

Distributing the authority between controllers and computer causes another problem. In a computer-based system one automated planner generates one overall plan, which then is divided into several sub-plans and distributed to the respective controllers in the different sub-sectors. This means the computer provides some kind of "master-plan". If this overall plan is not apparent in the sub-plans, the sub-plans might not be transparent, understandable and acceptable to the controllers. Therefore it is important to provide additional information on the overall plan, either "on request" or permanently.

Another problem resulting from the

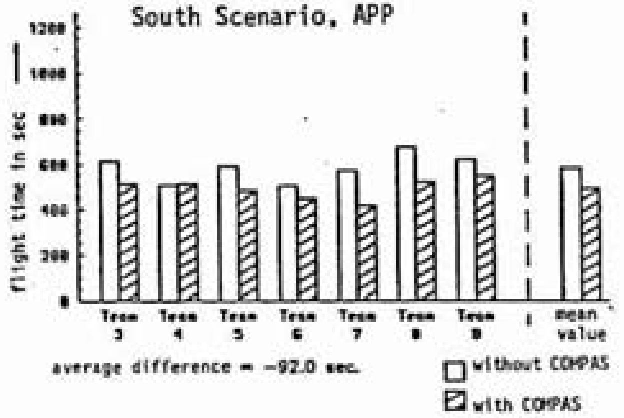


Fig. 7 Average flight time in the APP area

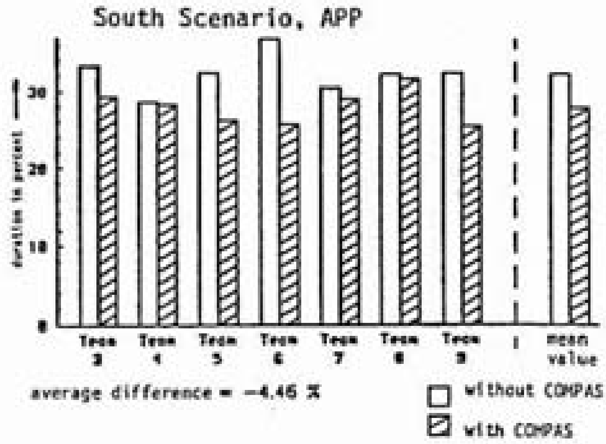


Fig. 8 Relative duration of voice communication in the APP area

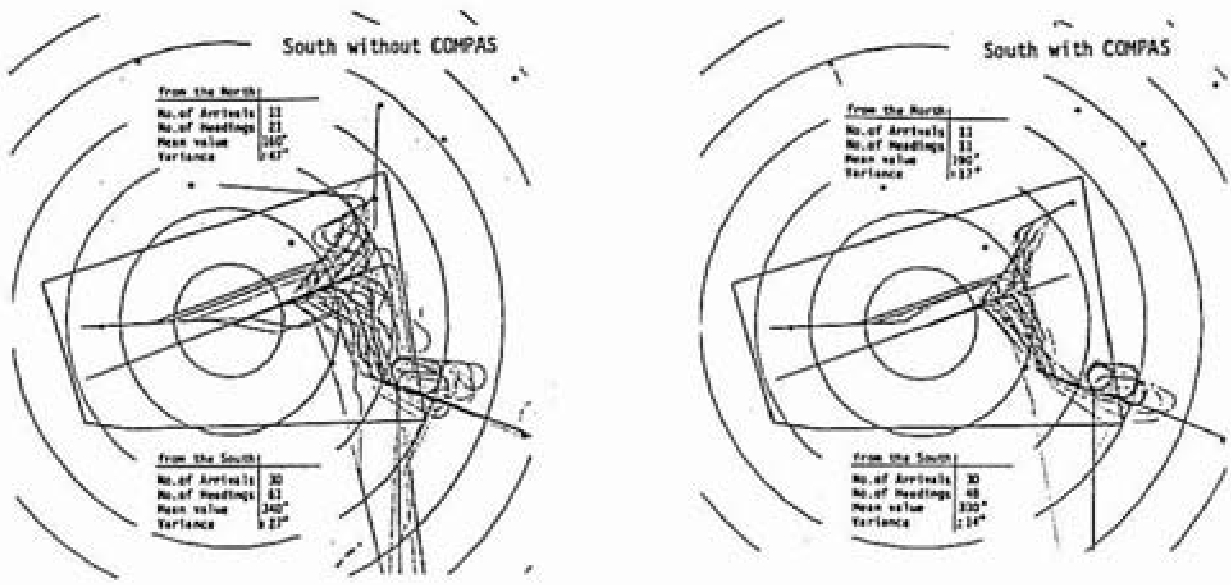


Fig. 9 Comparison of two simulation runs without and with COMPAS

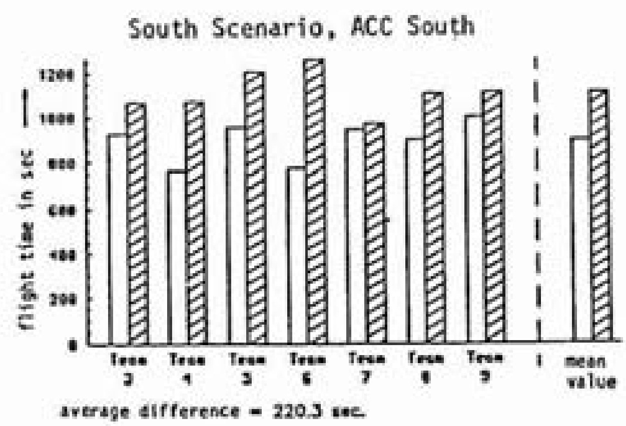


Fig. 10 Average flight time in the ACC area

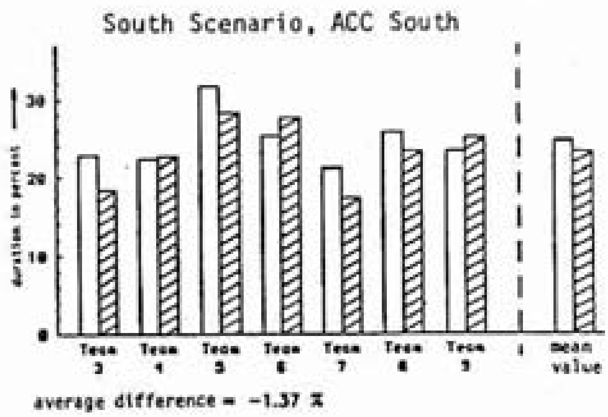


Fig. 11 Relative duration of voice communication in the ACC area

distribution of sub-plans is, that plan modifications may originate with different places. This leads to problems of priority, of conflicting interactions, of deterioration of the general goal of the planner and of the stability of the planning process as well. For the COMPAS experimental system with only 2 controller working stations satisfactory solutions have been worked out. In an operational system with a greater number of controller working stations this problem has to be resolved very carefully.

4.2 Display and Controls

As mentioned above the user requirements are to display just the necessary data, in a clear and understandable form and to minimise the need for keyboard inputs. This led to simple, but very clear display formats and function keys.

The basic version of the display format for the arrival controllers is shown in Fig. 4. The coloured display shows at top right:

- the landing direction in use; (25)
- the airport acceptance rate; (Flow 3.0 means: unrestricted flow, with 3 NM minimum separation when permitted).

The left hand part of the display shows a time-scale for the next 20 minutes, with the actual time (10.17 h) at the bottom. The expected arrivals in this sector are displayed with their callsign and wake-vortex-class (H). The leading aircraft is at the bottom (according to the typical arrangement of the flight progress strips on the stripholder board). The small box on the bottom represents the Gate, giving the indication that, e.g. the JU 358 should be over the Gate at 10.17h, followed by the AY 821 about 85 secs. later, etc...

The letters left of the time-scale give a rough indication of the suggested control action. Four qualitative suggestions are made to the controllers in order to establish a smooth, dense landing stream:

"X" - expedite (30 secs. up to 2 minutes),

"Q" - no action (± 30 secs.),

"R" - reduce (30 secs. up to 3 minutes delay),

"H" - hold (more than 3 minutes delay).

As an example: the LH880 should arrive at the Gate at about 10:26 and it should be reduced. Because the LH880 is a HEAVY-type aircraft, increased wake-turbulence-separation is planned for the succeeding JU350, which has to be expedited in order to catch its landing slot.

There is no proposal for the specific control command. Whether speed control, delay vectors or a combination of both is to be applied, is left to the judgement and experience of the controller, who will consider the entire traffic situation.

The display formats for the sector controllers are configured accordingly. However, the box at the bottom then corresponds to the "Time over the Metering Fix". Displayed is the whole sequence, i.e. the sequence to be merged from all approach directions. According to the colour of the stripholders used in the different approach sectors the labels are presented in the respective colours. This indicates from which direction an aircraft could be expected and gives a hint to the controller for what reasons the computer possibly has made a different proposal, than the human controller would have done, with his limited knowledge of the overall situation.

In case of higher degrees of automation or if even more sophisticated "intelligent" planning algorithms are applied, the questions of transparency and understanding become even more important, as the controller must be able to fully monitor the automated control process and to take over control in case of emergency at any time.

In this application of a semi-automated sub-system the solutions provided for transparency and

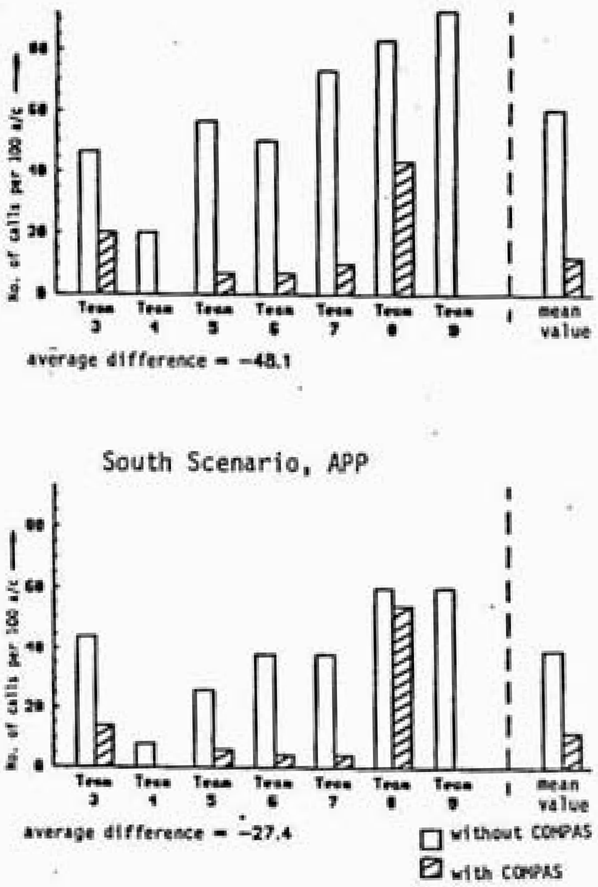


Fig. 12 Frequency of coordination per 100 aircraft between ACC and APP control

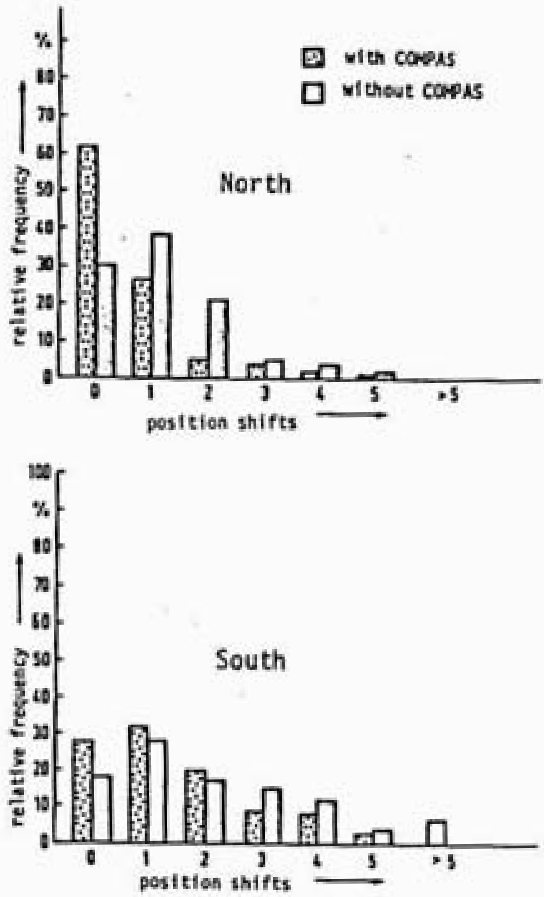


Fig. 13 Position shifts versus the "First Come First Served" sequence

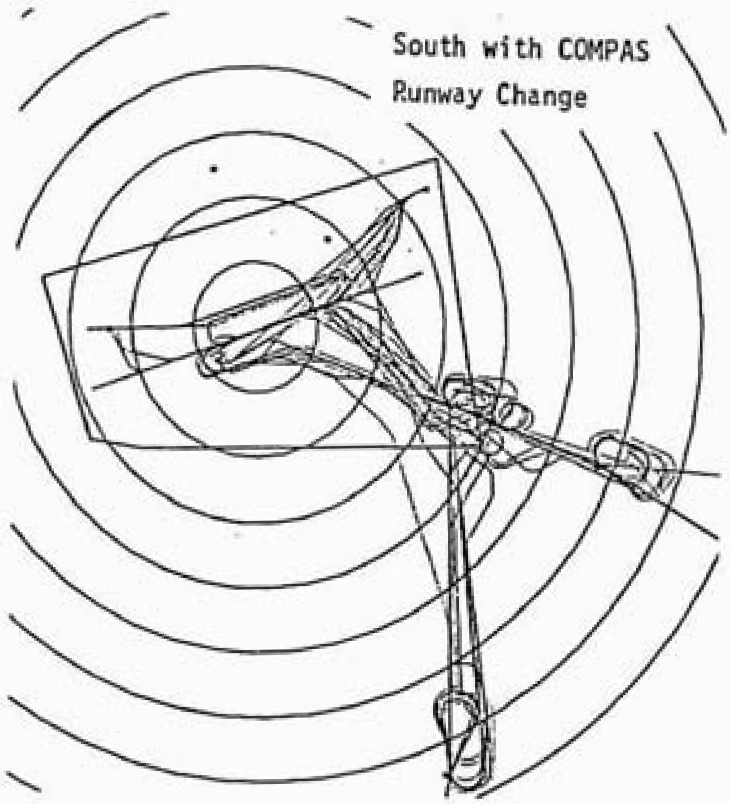


Fig. 14 Execution of a runway-change from 07 to 25

acceptance were worked out in close cooperation with the users.

As mentioned above, the controller is allowed to modify the computer generated plan if he desires or if unforeseen events have to be matched.

Fig. 5 shows the dedicated functions keyboard, which is used for controller/computer interaction. There are 8 (2 spare) function keys to activate the operational interventions described above. In addition there are "clear"- and "Execute"-keys and the so-called "-/+"-keys which are used either:

- to move a cursor down or up the time-scale, in order to identify or modify the plan of a specific aircraft, for example for a sequence change;

or

- to increase or decrease parameter values; e.g. if the flow rate has to be changed: after pressing the FLOW-key, first the actual value is displayed on the input-control-line (bottom right). Then the value can be increased or decreased with "-/+"-keys. The desired value is activated with the EXECUTE key.

5. Evaluation of the system performance

All operational capabilities (Table 1) of the COMPAS-system have been tested and investigated in numerous simulation runs in the ATMOS (Air Traffic Management and Operations Simulator) facility (Fig. 6). The performance of the COMPAS-system was evaluated employing the same real-time simulation facility again, to demonstrate the impact of COMPAS on the process of planning and control and control of air traffic as well as on the workload (human factors evaluation) of the controllers.

The consistency and reproducibility of the working conditions in such a real-time simulation environment have been used for a comparative investigation of the present approach control process without any computer based planning aids versus the same process employing the COMPAS system. The most important results are illustrated in the following by some typical statistical data as well as plots of radar tracks for the so-called south scenarios, i.e. with a high percentage of aircraft coming from the south. The given numbers from the simulator investigations should only be regarded as valid for comparison between different simulation setups. They should not be compared to real world data, since a simulated environment does never fit a real world environment really perfectly.

Based on several specific data evaluations the impact of the COMPAS system is as follows:

APP-area (Approach control area)

- The average flight time within the APP-area was significantly lower, when the COMPAS system was utilised (Fig. 7).
- The communication load was lower, especially in case of high traffic density (Fig. 8).
- With COMPAS the number of vectoring commands was lower, i.e. the given heading advisories aimed at a more direct track to the merge gate. The variance of the heading angles was much smaller (Fig. 9).

ACC-area (Sector control area)

- According to the COMPAS concept the time compensation was performed mainly in the ACC-area. This yielded to longer flight times as well as a higher number of airplanes within the ACC-area, when the COMPAS system was working (Fig. 10).
- The increase in traffic load in the ACC-area, however, did not result in a higher number of heading advisories within the ACC-area or a heavier communication load, respectively (Fig. 11).

APP and ACC area together

- COMPAS allowed for an early adjustment of arrival times within the ACC-area, thus enabling a very direct routing in the APP-area combined with a considerably lower planning and control effort (Fig. 9).
- The amount of coordination between the two control sectors APP and ACC was essentially reduced (Fig. 12).
- COMPAS achieved a proper sequence of aircraft and a lower number of sequence changes, i.e. it followed more perfectly the rule of "First Come First Served" (Fig. 13).
- COMPAS supported the planning function but did not prescribe the controller, how to perform the execu-

tive function. Modifications to the plan could be done interactively by the controller utilising a dedicated function-key panel, but were normally not necessary as the lower number of manual inputs indicated.

- COMPAS provided a clear an transparent overall plan to all controllers involved. This was proven, among other things, by the execution of runway changes running very smoothly (Fig. 14).
- All 32 controllers participating in the development as well as evaluation runs considered COMPAS as a very efficient tool to reduce their workload. COMPAS was highly accepted, especially its overall philosophy of computer assistance comprising a comprehensive and transparent information to the controller, despite occasional criticism of some specific details. Even after only a very short familiarisation phase the controllers had no problems to make use of the COMPAS system and to perform well. There is a good chance for an even higher level of performance and further improvements after a longer period of working with COMPAS.

6. Outlook

The very encouraging results gathered during the evaluation phase as well as the high level of acceptance gained by the controllers, who had participated in the project, have led to the conclusion, that such computer assistance should be made available at the Frankfurt Air Traffic Control Centre as soon as possible.

At this time there is a contract under way between DFVLR and BFS, which aims at the development of an expanded experimental COMPAS system and its installation at Frankfurt. This system will be used especially to get additional experience in an operational environment and life traffic. The so-called COMPAS-op system is designed for about 10 control position and two additional information displays for the airport operator. It is planned to have the system installed at Frankfurt within the next 2 years.

7. Conclusion

The described computer-based planning system has been developed in all its elements at the DFVLR-Institute for Flight Guidance. It has been tested and evaluated at the institute's air traffic simulation facility, using traffic scenarios of Frankfurt Airport in real-time simulations, with up to 52 aircraft movements simultaneously.

The dynamic planning algorithm as well as the operational concept for computer assistance and the man-machine interface not only proved to be feasible, but were also readily accepted by more than 30 air traffic controllers from the Frankfurt Air Traffic Control Centre, who took part in the tests and evaluations.

Thus a first step towards the introduction of intelligent computer assistance for the controllers has been successfully achieved. It is, however, quite obvious, that this step of transferring human planning and decision making functions to a computer is still limited, with respect to the operational requirements of the user. A next step to go ahead with, is to implement some human controller heuristics in a rule-based system, which will then be coupled with the described algorithm. Essential for any operational application, however, are not only appropriate models and suitable computer capabilities, but in particular the careful design of elements and procedures for the man-machine interface.