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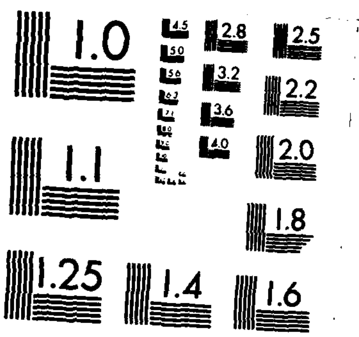

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AIR COMMAND AND STAFF COLLEGE

STUDENT REPORT

INTRODUCTION TO EUROPEAN AIR TRAFFIC CONTROL

MAJOR IAN J. HAYES 85-1095

"insights into tomorrow"

DISCLAIMER

REPORT NUMBER 85-1095

TITLE INTRODUCTION TO EUROPEAN AIR TRAFFIC CONTROL: AN SIFC HANDBOOK

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The Strategic Air Command's authoritative source for instrument flight procedures, SAC Instrument Flight Course (SIFC), has no comprehensive vehicle with which to introduce the European flight environment to crews that may deploy into the unfamiliar airspace. The study acquaints the reader with the overall nature of flying in the European theater and introduces some procedural differences. The study also looks at how the European system is organized, by examining the airspace structure. The study concludes with a look at the military/civilian dichotomy of airspace control in Europe.

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PREFACE

The Strategic Air Command has a unique mission in that it is largely concerned with the defense of the US and is the principle employer of our nuclear deterrent forces. As such, most of it's training missions take place in the continental US preparing for this nuclear eventuality. Very rarely do it's crews get to deploy to foreign theatres; and when they do, it is on a rotational, temporary duty (TDY) basis. SAC's Instrument Flight Course, SIFC, has recognized an experience shortfall among SAC's aircrews relative to foreign operations. By the very nature of the SAC mission, aircrew errors in foreign countries can lead to dreadful embarrassments for the US Government. To preclude such embarrassments, SIFC has tasked ACSC to develop an introduction into the European Theatre of operation. This handbook is intended to be used as an educational aid during mission planning for deployment to the European theatre, which will aid crews in their understanding of how European airspace is arranged and who is controlling the operation from the ground.

ABOUT THE AUTHOR

Maj Hayes is a senior pilot who has been in the US Air Force since 1970. He has been assigned to the Strategic Air Command for his entire career, and has flown KC-135 tanker aircraft for thirteen of those years. In his operational experience, Maj Hayes has flown combat missions in SE Asia, as well as operational missions in the Pacific, European, and Caribbean theatres. An alumnus of the University of Rhode Island, Maj Hayes holds a B.A. in Psychology and has been awarded his M.A. in Human Relations from Webster University of Missouri. He has completed Squadron Officer School by correspondence, and previously had completed Air Command and Staff College by seminar prior to selection for residency. Maj Hayes' last assignment before ACSC attendance was as a major command evaluator in the 1st Combat Evaluation Group (SAC).

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EXECUTIVE SUMMARY

REPORT NUMBER 85-1095

AUTHOR(S) MAJOR IAN J. HAYES, USAF

TITLE INTRODUCTION TO EUROPEAN AIR TRAFFIC CONTROL: AN SIFC HANDBOOK

I. Purpose: To provide Strategic Air Command crew members a better understanding of how European airspace is managed between the civilian and military operators.

II. Problem: SAC crewmembers accomplish most of their training in the U.S. and, as such, do not have an opportunity to familarize themselves with foreign country air operations until called upon to actually deploy. Such on-the-job training in foreign airspace should not take place. Preparation for deployment is up to each unit to accomplish, but this preparation definitely varies in quality.

III: Data: Unlike the U.S. where the FAA runs the entire airspace operation and military users are handled like their civilian counterparts, the European air traffic system is characterized by an intricate and complex web of co-ordination and control between both civil controllers and military controllers. Each is responsible for operating certain areas of airspace, and a typical European sortie may have a crewmember interfacing with both types of controllers. An unprepared crewmember may become confused to say the least. Additionally, the majority of flying in Europe is done via airways, high and low, and SAC crewmembers rarely get a chance to practise airway navigation in the U.S. because of other training constraints. European airspace is de-

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signed differently than that of the U.S. in that there is much more uncontrolled airspace, and the excellent radar service crewmembers have become so reliant upon in the U.S. may not exist in European airspace. Even the paperwork is different, and filing a flight plan which may span several sovereign nations in a relatively small airspace can be quite complex.

IV. Conclusions: There is no substitution for preparation. A crewmember who knows and understands the environment in which he/she will fly will be more effective and more safe. Proper education before deployment into foreign countries will greatly aid the Air Force mission and enhance U.S. foreign relations through prevention of embarrassing incidents.

V. Recommendations: SAC should pay close attention to the training needs of its crewmembers in terms of acquainting them with foreign flying procedures. A core program needs to be developed around which local units can develop pre-deployment training programs.

GLOSSARY

ADIZ	Air Defense Identification Zone
AF	Air Force
AFR	Air Force Regulation
AMSL	Above Mean Sea Level
ANP	Air Navigation Plan
AP	Area Planning (Document)
ARTCC	Air Route Traffic Control Center
ARTS	Advanced Radar Terminal System
ASR	Airport Surveillence Radar
ATC	Air Traffic Control
ATCRBS	Air Traffic Control Radar Beacon System
ATIS	Automatic Terminal Information Service
ATS	Air Traffic Service
BENELUX	Belgium, Netherlands, Luxembourg Region
CAB	Civil Aeronautics Board
CCA	Continental Control Area
CEAC	Committee for European Airspace Coordination
CONUS	Continental United States
CTA	Control Area
CTZ	Control Zone
DCT	Direct
DME	Distance Measuring Equipment
ENAME	Europe-North Africe-Mediterranean (Region)
EUROCONTROL	European Air Traffic Control Conglomerate
FAA	Federal Aviation Administration
FCG	Foreign Clearance Guide
FIR	Flight Information Region
FL	Flight Level
FLIP	Flight Information Publications
FSS	Flight Service Station
GAT	General Air Traffic
GCS	Ground Controlled Approach
GCI	Ground Controlled Intercept
GP	General Planning

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IAW	In Accordance With
ICAO	International Civil Aviation Organization
IFF	Identification Friend or Foe
IFR	Instrument Flight Rules
ILS	Instrument Landing System
IMC	Instrument Meteorology Conditions
JCS	Joint Chiefs of Staff
MEA	Minimum Enroute Altitude
MIJI	Meaconing, Intrusion, Jamming, Interference
MOCA	Minimum Obstruction Clearance Altitude
NATO	North Atlantic Treaty Organization
NAV	Navigation
NOTAM	Notice to Airmen
OAT	Operational Air Traffic
PAR	Precision Approach Radar
PCA	Position Control Area
PPR	Prior Permission Required
RAN	Regional Air Navigation (Meetings)
RAPCON	Radar Approach Control Facility
RNAV	Area Navigation
SAC	Strategic Air Command
SID	Standard Instrument Departure Procedure
SSR	Secondary Surveillence Radar
SST	Supersonic Transport
TAC	Tactical Air Command
TACAN	Tactical Air Navigation
TCA	Terminal Control Area
TDY	Temporary Duty
TERPS	Terminal Radar Procedures
TRACON	Terminal Radar Control Facility
UAC	Upper Area Control Center
UHF	Ultra High Frequency (Radio)

CONTINUED

UIR	Upper Flight Information Region
UK	United Kingdom
US	United States
USAF	United States Air Force
USAFE	United States Air Forces in Europe
USSR	Union of Soviet Socialist Republics
VASI	Visual Approach Slope Indicator
VFR	Visual Flight Rules
VHF	Very High Frequency
VMC	Visual Meteorology Conditions
VOR	VHF Omni Range
VORTAC	VHF Omni Range & TACAN - Collocated

Chapter One

INTRODUCTION AND REGIONAL DIFFERENCES

INTRODUCTION

Since the end of World War II, the United States has contributed significantly to the development of air traffic control throughout the world, particularly in Europe. Close allies, then as now, the US Government, and US Air force in particular, devoted much time, money, and equipment to help the Europeans build a modern air traffic control system. Despite this "parentage", the European system still differs from that of the US in several regards. The purpose of this handbook will be to present some of those differences, with particular emphasis on the unique civilian/military dichotomous nature of the European air traffic control system. Obviously, when dealing with a geographically close, heterogeneous mixture of independent, sovereign nations, many variations and details are likely. The European region will be dealt with as a generalized "whole", and major differences cited by exception. Full details of each country are beyond the scope of this project. For particular specifics governing any one country, consultation with the Flight Information Publications, Foreign Clearance Guide, and International Civil Aviation Organization regulations is the only recourse to ensure adequate mission preparation.

Why should we bother to undertake such an effort? Because the US mission is global, and it is the responsibility of all operational leaders to ensure that aircrews are getting the best training possible, not just at home, but in foreign theatres as well. At last estimate, "when counting the airspace over the nations, with which the US has reciprocal agreements plus the open seas. . .the US can fly over about 15/16 of the earth's surface with a fair degree of freedom". (14:12) The international nature of the sky and its resulting agreements obligates us to learn as much as we can about the airspace in which we fly. Additionally, air traffic volume is on the increase, civil and military, and great concern exists on the ability of present day equipment to meet future demand. Will the military mission be affected, or even squeezed out of the picture, as civil aviation puts more demands on the air traffic control network? This issue will be addressed in Chapter Three in more detail.

The European region in itself is an area for study. Many countries are closely aligned physically, yet are fiercely independent and sovereign, and have developed an incredibly complex route structure. The need for close coordination among them will be examined.

In order to be continually effective in the rapid support of US national objectives around the globe, we must prepare to respond; we can successfully do this if we are familiar with the region of the world where we carry out our mission.

> The US Air Force must fly its aircraft essentially anywhere in the world on very short notice, and the following are of prime interest: existing ATC facilities in terms of airspace allocations, control services, rules and regulations, and communications and navigation equipment. (10:29)

Chapter Two will discuss airspace management, and Chapter Three will deal with the civilian/military control aspects of European Air Traffic Control.

The remainder of this chapter will present some major regional differences crews may expect to encounter while flying in the European region.

REGIONAL DIFFERENCES

Mission Preparation

One of the first areas of difference facing a crewmember is where he can find information about the foreign region into which he is about to fly. To the experienced and inexperienced, long mission preparation and familiarization with various publications is essential. Time will be considered well spent if it centers around the following publications: Flight Information Publication (FLIP) General Planning; FLIP Area Planning (AP/2) (Theatre Procedures); the green-colored Enroute Supplement for Europe-N. Africa-Mediterranean region (ENAME); high and low enroute charts; the Flight Information Handbook; and the Foreign Clearance Guide. Becoming familiar with these items during the planning phase will help alleviate confusion later during flight should something unexpected occur. Pay particular attention to the enroute charts and airway symbology. This is because SAC crews don't often get the opportunity to fly airways, and airway navigation is the principle form of navigation in the European region for civil and military alike. Crews must be intimately familiar with their routes. Highlighting the routes with "magic marker" pens is helpful, along with danger symbols like one-way arrows. Also note position reporting procedures and points, since not all of European airspace is under positive control as in the US. Airways are discussed in more detail in Chapter Two, Airspace Management.

The ICAO Flight Plan

Crews not familiar with the ICAO flight plan, DD 1801, often approach the undertaking with some trepidation. Most SAC crews will likely leave this bothersome chore to the staff operations people who schedule and plan the missions. But it need not be that difficult if a little time is spent with FLIP GP. It refers crews to the Foreign Clearance Guide (FCG) for "flights destined into or over a foreign country". Crews should not forget to reference AP/2 for regional specifics. Some pertinent facts to remember are that stopover flight plan procedures cannot be used with the DD 1801; for stopovers, each leg of the flight has to have a separate flight plan, but they may all be filed on the initial leg. (9:49)

A sample ICAO flight plan is shown in Appendix I for a reference to aid in the following discussion. The following outline presents a brief remark or two regarding the more pertinent items on the DD 1801 with which crews should be familiar:

Item 7 - Limit aircraft identification to seven characters; tactical call signs are permitted.

Item 8 - Use "I" for IFR, "V" for VFR; "M" for military or "G" for general aviation (e.g. IM).

Item 9 - Enter the type of aircraft, preceeded by a number if there are more than one in the flight; also indicate the aircraft category based on takeoff weight:

H over 300,000 pounds
M 15,000# to 300,000#
L less than 15,500 pounds

Item 10 - This section can be tricky. Enter the type of comm/nav approach equipment needed to fly the intended route including approach ("Standard" equipment is defined as: VHF, ADF, VOR, and ILS - if this is all that's required, enter "S" for standard). Other equipment may be needed; if so, enter IAW the list in FLIP GP.

Item 13 - Enter 8 characters showing the aerodrome of departure and time; also, 8 characters indicating each FIR Boundary to be crossed and the expected time.

Item 15 - This is a complicated section. Enter true airspeed, flight level, and route of flight. There are two ways to file: on airways and off airways. If the aerodrome of departure is on such a route, enter the designation of the airways route; if not, enter "DCT" (Direct) and the point where it is joined and its designator - when off airways, points filed cannot exceed 30 minutes or 200NM apart, and "DCT" is used between successive points; also geographical coordinates (7 to 11 characters - e.g. 55N060W) can be used, as well as NAVAID and bearing-type information (9 digits - e.g. DUB090040). Remember, any change in airspeed or flight level requires an entry associated with a filed point and indicated by oblique stroke (for example - DUB090040/0200F310).

Item 17 - Enter 8 characters showing the ICAO destination and time. For IFR flights, the time is when you arrive over the point from which an instrument procedure will be commenced.

Item 18 - This is the remarks section, but requires certain entries such as: any altitude reservation (ALTRV) of which your route may be part; additional comm/nav equipment carried; diplomatic clearance numbers/PPR numbers; a flight plan change from OAT or GAT (see Chapter Three).

Many of the remaining items of the DD 1801 are self-explanatory; crews should simply cross out items which do not apply to their aircraft equipment.

This discussion should have aided in understanding some of the requirements of the DD 1801, but it by no means is all that there is. Only through serious study of FLIP GP and continued use of the document can crews expect to become comfortable in filling out the DD 1801.

Altimeters

Flying through European airspace can be a real challenge in simply trying to determine what the correct altimeter setting should be, since not all airspace regions employ the same altimeter setting. The following definitions will aid the discussion.

Transition Altitude: The altitude in terms of feet above mean sea level (AMSL).

Transition Level: Lowest acceptable flight level.

Transition Layer: The airspace between the transition altitude and the transition level.

Previous study of the letdown plates and enroute charts should have revealed the transition altitudes (TA) for specific regions. On letdown plates, TA's are shown on the profile view of the approach. As crews may have noted, these altitudes change from region to region, and even from airfield to airfield within the same region (and be different from the regional setting). Since many of these setting changes occur in the lower airspace (unlike the standard FL180 in the US), and this lower airspace is largely uncontrolled with only radar advisories available (see Chapter Two), a missed setting change could put you in the transition layer at the same altitude with another aircraft who also has a different (QNH) altimeter setting. (2:8-11) Even though the transition layer runs approximately 500 feet to 1000 feet, that's still too close. Crews can avoid an altimeter setting error by listening to the controller terminology. If he wants you to fly a QNE altitude, he will use the term "flight level" (set 29.92). If he wants you to use QFE (height above aerodrome), he'll state "your altitude in feet on the aerodrome QFE". If QNH is to be used, he will generally omit either term. (2:8-11) Here is a quick review:

QNH: Set when operating below or descending through the transition level (approx. 3000 feet in uncontrolled airspace); it is regional in nature and drives the transition level based on pressure fluctuations.

QNE: Set 29.92 climbing through the transition altitude (maintain QNH until then); this setting is used at and above the transition altitude. On descent, maintain this setting until descending through the transition level (which is given by ATIS or the controller - it is not published anywhere).

QFE: Reads actual surface pressure and results in an altimeter reading height above field elevation (in other words, the ground equals zero). RAF controllers and some RAF bases in Germany give QFE even though approach plates are QNH - you can request QNH settings from the controllers or fly the HAA/HAT on the plate instead of the MDA/DH. (6:1-4)

Crews should consult the ENAME for details regarding the proper procedures.

Equipment

The ICAO has made tremendous efforts to standardize not only instrument procedures throughout the world, but equipment as well. This is important because USAF global power projection is dependent not only on airbase availability, but also on compatibility with area navigation aids, communications, and landing aids.

Crews trained in the US environment should have little difficulty transitioning to the European theatre. VOR/DME and VHF have been the ICAO standard equipment for member states for years, with the UK and Central European region having also employed many TACANS. SAC aircraft, by mission design, are not specifically dependent on ground navigation aids and are constituted of largely long-range aircraft; hence, occasional shortfalls of ground navigation aids in some region should not be too large a problem. All aircraft, however, must rely on ground aids for landing. Here, ICAO has standardized the ILS as its standard for member nations. Crews will find ILS installed at all major civil and military installations throughout Central Europe.

In terms of communications, SAC aircrews could be at a disadvantage. Largely UHF radio users, SAC crews will find practically all of Europe VHF-oriented for the civil carriers, but with a UHF capability for military users. The trick is to get the VHF controllers over to the UHF frequency. Some European countries (Ireland, Sweden, Austria) are VHF only, as are the Middle East and Africa. SAC has countered by purchasing some "palletized" VHF sets stationed at FOB's in the European region for installation on TDY deployers. Although all ICAO nations have adopted English as a language standard, not all controllers speak it all the time or equally well, often with a heavy accent or sometimes employing strange terminology. Crews will need to exercise patience and ingenuity in dealing with foreign controllers. Here are some interesting examples of terminology used in the United Kingdom and the US equivalent:

UK	US
Avoiding action	Immediately
Overshoot	Low approach
Talk down	Precision approach
Identified	Radar contact
Tanking	Air refueling
Further intentions	Say intentions

(9:AP/2)

Emergency Procedures

Emergency procedures can be extremely complex and are definitely variable based on country. Crews need to consult the Flight Information Handbook and FLIP AP/2 for specific country emergency procedures. Joining, crossing, or departing controlled airspace under lost communications is also discussed.

MIJI

Flying in Europe can be fun. But all SAC crews should be aware that they are subject to meaconing, intrusion, jamming, and interference (MIJI) by enemy agents at any time. This can run the gamut from static interference to actual broadcast of false navigation signals. Intentional MIJI actions have become an item of interest for the Joint Chiefs of Staff. (9:5-15) Crews are instructed to report MIJI (suspected/known) via secure means after they have landed, and to air-transmit such information only if it can be done securely. The bottom line for crews is to be alert and use all available navigation back-ups. Additional information can be found in AFR 55-3 (AR105-3), and from local communications officers.

Buffer Zones and the Berlin Corridor

Buffer zones have been established throughout the European (Mediterranean) region which are strictly monitored, and prohibited to USAF aircraft which do not meet certain requirements. These zones generally follow the borders between NATO countries and those of the Warsaw Pact in Central Europe, Northern Italy, Greece, and Turkey, and are shown by "teeth point" symbols on charts (see Appendix II, Chart Symbols). USAFE Reg 60-17 stipulates the requirements that aircraft must meet in order to fly in these zones. Individual zone procedures for navigation, emergencies, and lost comm are complex, and are contained in Section C of the ENAME. Also in the ENAME are extensive geographical coordinates for delineation of the buffer zones.

When World War II ended, Berlin was placed under the four-party rule of US, USSR, France and Britain. This divided rule still exists today, even though Germany has been split into separate East and West countries espousing opposing political systems. Berlin exists as an "island" of Western politics and culture in the Soviet-oriented, communist block country of East Germany. To reach Berlin, Western air transports must fly through special corridors established in West Germany near Hamburg, Hehligen, and Fulda, and which extend like spokes to Berlin. Entry and transit are strictly controlled, and all flights are USAF Headquarters directed and approved. Special crew briefings are required, and the possibility of MIJI is high. Airspeeds, flight levels, and communications are established. Full procedures for transit of the Berlin Corridors is contained in the ENAME, Section C, and USAFE Reg 60-20.

Thus far we have discussed some of the more obvious differences of flying in the European region. Crews who have operated solely within the "luxurious" positive air traffic control system of the US will have their individual resources tested and their crew coordination abilities sharpened as a result of a TDY to Europe. Throughout this chapter we have emphasized crew preparation and extensive mission planning. To operate without this preparation would be irresponsible. USAF military operations must be capable of worldwide response and compatibility with ICAO systems, and the biggest factor in this capability is crew preparedness.

The next chapter will begin our exploration of European airspace and management.

Chapter Two

EUROPEAN AIRSPACE MANAGEMENT

GENERAL BACKGROUND

Air traffic control throughout the world ranges from the sublime to the non-existent. It is made difficult because aircraft do not want to just go from point A to point B, they want to go up and down as well. It is this flexibility in movement that causes control problems. The European system has made great headway in the last few decades, largely due to material and monetary contributions from the US since World War II. But it still does not approach the level of sophistication seen in the US itself, and consists of "pockets" of good and bad service. This chapter will discuss airspace management from a macro to micro viewpoint, with emphasis on the European system, and will include a brief introductory synopsis of the US system for comparison.

Air traffic control (ATC) is an incredibly complex mix of many elements that can "directly influence the safe conduct of an aircraft through the air, and can even determine the actual nature of the ATC system itself". (12:13)

> Accordingly, ATC consists of a series of closely interlocked, interacting and interfaced elements including:
>
> 1. Aircraft (crew ability, performance, equipment).
> 2. Users (types of aircraft & operations)
> 3. Operators (civil & military, combined or separate)
> 4. Facilities & equipment
> 5. Airspace (dimensions, allocation, management)
> 6. Weather
> 7. Airports & airbases (landing aids, runways)
> 8. Rules, regulations, procedures
> 9. Flight Data & Information (charts, manuals, NOTAMS, etc.) (12:10)

It is to airspace itself that this discussion will now turn.

AIRSPACE ORGANIZATION

ICAO

The ICAO has divided the world's airspace into nine regions - North Atlantic, Caribbean, South America, European, Africa-Indian Ocean, Middle East, Southeast Asia, Pacific, and North America and Alaska (see Appendix VII). Each of these regions is further divided into several Flight Information Regions (FIR), consisting of over-ocean airspace and ICAO member nation airspace over land masses. Additionally, superimposed over most of Central Europe and other parts of the world have been Control Areas (CTA) called Upper Flight Information Regions (UIR). ICAO officials realized it would be difficult, due to the inter-relationship of the two airspace divisions, to deal with them separately; and as a result of world traffic increases and technological advances, an elaborate ATC system has evolved.

ATC service generally consists of four parts: area control, zone control, approach control and aerodrome control. (5:7) The basic unit of ATC organization is the sector, a well-defined piece of airspace usually containing multiple controllers and multiple radio frequencies. (5:8) Coordination problems can exist, and aircraft in a common sector often cannot hear each other and must rely on ground control. Up to 80 sectors can exist in a single ATC center, and as a rule follow either geographical boundaries for division lines, or flight levels. "The overall problem facing an ATC center is to help evenly distribute controller workload throughout the sectors and to determine a smooth plan for traffic flow". (5:10)

The ICAO maintains that each member nation has the right to allocate airspace as it chooses, but it must meet certain international standards of agreement and be able to service the users of all countries. The discussion will now turn to some specific member nations and how they have chosen to use their airspace. The European region will be dealt with as a general area; for country-specific details, FLIP AP/2 should be consulted. But first, a quick review of the US system for comparison.

US ATC

Many say that the US ATC system is the most complex in the world. Actually, compared to the diversity seen in such a small geographic area in the European region it seems rather simple, and geared to almost total air traffic service. It consists of two principle areas, the Continental Control Area and the Positive Control Area. The CCA consists of all airspace in the contiguous US at and above 14,500ft MSL, except that airspace less than 1500ft AGL and the restricted/prohibited areas. (9:3-1) The PCA takes that part of the CCA from 18,000ft MSL up to and including FL600 (except in Alaska where some special procedures exist - see FLIP). In order to operate in the PCA there are certain restrictive rules regarding equipment needs, such as: IFR capability, mode 3/A, 2-way radio, and ATC approval of the flight. Local training areas are set up in the CCA/PCA to permit activities such as military training flights which are not adaptable to the ATC system, but in which an ATC clearance is still required.

The US has two airway navigation systems since the elimination of area navigation (RNAV) in the conterminous US. The first is the VOR airway system, or low system. It runs from 1200 feet AGL up to, but not including, 18,000ft, and is based on periodically spaced VOR/VORTAC stations for progressive "connect-the-dot" navigation. The low enroute charts are used, and routes are indicated by the letter "V" with a route number (e.g. V23). The Jet route structure is the second system, and extends from 18,000ft up to FL450 inclusive. Also based on VOR/VORTAC spacings, the high enroute charts are used to track along the blue jet routes shown by the letter "J" and its respective airway number. For special aircraft, there is also a High Altitude Area System above FL 450 that is not structured and consists of free route selection.

The previously mentioned RNAV system requires some elaboration. Fixed routes, such as might have existed on enroute charts at one time, have been revoked, with only a few still existent in Alaska. Random RNAV routing, or direct flight between predetermined points without reliance on ground navigation aids, can be obtained on a limited basis with ATC approval. For an aircraft to be allowed to fly RNAV, onboard equipment like doppler radar, inertial navigation systems, and course line computers have to be part of its navigation equipment. Operating tolerances for RNAV, such as flying the centerline of the intended route, are the same as flying airways. Major commands designate which aircraft can fly RNAV. (9:1-25)

Obviously, there is more to the US system than this brief description. For example, most aircraft in the US, which also includes the military, are under some sort of radar control from takeoff to landing. We in the US have grown used to such extended service and take its smooth operation and relative safety for granted. Not so in the European area. Also, no mention of approach control zones, tower controlled areas, etc. was made, and these areas can definitely compound the procedures. These areas are similar to those in Europe where much

US equipment and US know-how were spent to augment the European system. Let us now turn to that system.

European/Mediterranean ATC

Unlike the US where radar coverage exists in practically all corners of the airspace, there are large blocks of uncontrolled airspace in the European region. Much of this is by design or by limitation of the equipment or system. On the enroute charts, the white areas (including airways) are controlled airspace, and the darker areas, uncontrolled airspace (see Appendix III). Normally, in controlled airspace, ATC full radar services are provided and you must follow controller instructions; while in uncontrolled airspace, crews can expect advisories and flight information only, and these can come from a destination field, a control zone radar, or a military regional radar.

Within the NATO Central European area, all water and land masses are covered by FIR's containing controlled and uncontrolled airspace. (12:29) By ICAO convention, most European states have adopted the FL 245 plane of division between controlled and uncontrolled airspaces, with the upper portion controlled and the lower not controlled. (10:3-2) In uncontrolled airspace, crews may find themselves flying around with many others who are not in radio contact with any sort of controller. Military regional radars often pick up the slack in these instances; more of this in Chapter Three.

> Controlled airspace consists of control zones (CTZ), usually surrounding one or more close airports and airbases, and control areas (CTA) consisting of airways and terminal control areas (TCA), usually including major international airports. Military TCA's are those in which only military bases are located. Aside from TCA's containing airports or airbases, only civil airways are controlled and not all of those. (12:30)

A control area is that airspace extending upward from a specified height above the earth (not less than 200 meters usually), and laterally can take part or all of an FIR. Generally, CTA's extend up to FL460 in order to permit the use of FL450. The lower limits of CTA's are established to allow adequate airspace for VFR flights to operate below the control areas. CTA's can be of the broad "area" type or the narrow-banded airways type.

ATC is provided in all control areas and within the vertical limits of upper airways, which vary country to country. A sample listing of such limits is:

Belgium	FL 195-255
Denmark	FL 245-460
France	FL 195-460
Germany	FL 250-450
Spain	FL 245-460
UK	FL 245-460

A complete listing for the European/Mediterranean area is published in the front of the high enroute chart. Also, a review of the high enroute charts will reveal that along each airway are published the vertical limits of control for that section of the airway when they do differ from those published on the front of the chart.

A control zone (CTZ) fills the void between the ground and the lower limit of a CTA, and laterally is composed of all parts not encompassed by the CTA. As a general rule, the CTZ handles the IFR arrival/departure flight paths and not much else.

A terminal control area (TCA) is part of a CTA and supplements the CTZ in that it usually is at the confluence of major airways near busy airports. (9:6-2) This is the most dangerous zone not only because of congestion, but due to the fact that aircraft are changing altitudes, speeds, and configurations as well. A crew flying an IFR mission wouldn't be aware of these divisions as they pass from CTA, to TCA, to CTZ; just as they aren't in the US. The only indication would be a radio frequency and controller change.

ICAO Convention calls for the establishment of controlled airspace . . .

> around all international aerodromes where approach control service is provided to encompass the entire enroute portion of IFR flights. . .including the provision of approach control service (for climb to and descent from cruising level). . .and that all ATC routes be established as controlled routes. . . (11:2-10)

The discussion will now turn to an examination of these controlled routes, or airways.

Airways

Most airways in the European region are similar to those in the US in that they are generally characterized by a high/low distinction in airspace - the latter usually called "low-medium" in Europe. There have been some ICAO problems of standardization country to country, and occasionally the floor or ceiling of the two divisions conflict, necessitating a climb or descent to remain in the airspace of choice. The high altitude structure has a lower limit of FL200 except as noted on charts.

Airways are corridors of controlled airspace 10NM in width as set forth by ICAO agreement. (5:3-4) The upper limits of controlled airways-type airspace is determined state to state based on aircraft type. For example, for SST aircraft the upper limit is FL660; for turbo-jets it is FL460; for turbo-props it is FL360; and for recips, FL255. Lower limits vary from FL195 to FL245 for control areas established in the upper airspace, to 3000ft for control areas over land. (10:4-2) The vertical limits of upper airways are published on the front of the high enroute charts, and appear along the routes themselves on the charts.

VOR is the standard international navigation aid and the incidence of collocated VOR/DME is high throughout most member nations. The accuracy of on-board equipment and the ability to adhere to acceptable navigation standards is a "given" under ICAO rules. The "currently accepted overall VOR system performance gives an accurary of $\pm 5°$ at the 95% confidence level". (5:3-4) VOR beacons are normally established at 90 NM intervals. The width of an airway can increase proportionately based on a lesser confidence in navaid accuracy.

Both high and low enroute charts have a comprehensive legend which covers airways symbology published inside the cover of each chart. A sample legend appear- in Appendix II. As mentioned in the US overview, airways are referred to by alphanumeric designators, which are recommended by ICAO for standardized use worldwide. (9:6-6) These designators, along with suffixes and prefixes, are a means of route identification that relate to navigation capability, airspace vertical structure, or aircraft category usage limitations. The basic designators given in FLIP are:

- A,B,G,R - These are for routes which are part of the ATS network of routes, but which are not RNAV routes.
- L,M,N,P - These are for RNAV routes which are also part of the regional air traffic service (ATS) routes.
- H,J,V,W - These routes are neither ATS or RNAV routes.
- Q,T,Y,Z - These are RNAV routes, but not regional ATS routes.

Usually a route will consist of a basic designator and a route number, e.g. W22. SAC aircrews need not be concerned about these distinctions as most SAC aircraft possess sufficient navigation equipment to fly any route. Routes may contain certain prefixes, however, to further define the airspace or aircraft usage limitations. Some common FLIP prefixes are:

V - Route identified by VOR
T - Route identified by TACAN
U - Indicates upper airspace for the entire route or a portion of it
K - is for helicopters only, low level
S - is for supersonic aircraft only.

An example of a prefix in use would be the route defined as UA34, meaning route 34 was part of the ATS network in upper airspace. Additionally, along with prefixes and basic alphanumeric designators can be the use of suffixes which usually present some sort of flight following information. Two common FLIP suffixes are:

D - In which only advisory service is provided by ATS along the route, or a portion thereof.
F - Only flight information service is provided on the route, or some portion thereof.

It should be noted, as it is on the front of the high enroute chart, that advisory service is provided above all upper airways and corridors, whereas the airways themselves, by ICAO convention, are controlled.

Appendix III contains a reprint of a selected portion of a low chart, and Appendix IV contains a portion of a high chart. Referencing either one, note some of the symbols used, such as the large one-way arrow containing the alphanumeric designators. Note the predominance of one-way arrows (especially on the upper chart), a feature which is different from the US airways system, which encourages two-way flow. Usually associated with these large arrows are the small symbols of an A or B and a small arrow. On high charts these indicate the cruising altitudes for that portion of the route. The symbol A► shown along a one-way or two-way route refers to Fl210, 230, 250, 270, 290, 330, 370, etc.. (On two-way routes, select B-levels for opposite direction flight.) The symbol B► on a one-way route means FL200, 220, 240, 260, 280, 310, 350, etc..

Low altitude charts have the benefit of being generally less busy, that is, less congested with routes and symbols. Low routes will also show the vertical limits of control along the route as do the high charts; but unlike the high charts, there are no established vertical limits by country in the low region to be published on the front cover. Also, unlike the high charts, cruising level on the lows is simply stated as "odd" or "even". Odd consists of FL30, 50, 70, etc., and even consists of FL40, 60, 80, etc.. The low charts also show: large areas of uncontrolled airspace which are peppered by airfields and TCA's; airfield information; responsible approach control and it's vertical limits; and nav/approach aids are also shown. Minimum enroute altitudes (MEA) and minimum obstruction clearance altitudes (MOCA) round out the major differences between the high and low charts. Crews can expect to transition from a high to low chart during departure and arrival, so it's a good idea to have the charts out and ready.

Crews should spend time becoming familiar with their intended route(s), and the attendant symbols. Note particularly one-way routes, flight levels for direction of flight, position reporting points and possible controller frequencies. Even though ICAO has devoted much effort to reduce the number of symbols associated with air route definition, even casual study of either a high or low enroute chart (see Appendices III & IV) reveals a complexity that at times can be baffling. The discussion herein is by no means a complete study in airway symbology.

One problem often encountered is that military bases normally exist in uncontrolled airspace. As such, crews may be forced to cross or join airways from such airspace. To do so requires an ATC clearance. The clearance may be obtained prior to takeoff from clearance delivery, from the departure controller (normally military), from the advisory controller in controlled airspace (again military), or from civilian positive controllers after a hand-off. Joining places are depicted on charts, as are orbit patterns. Without a clearance, expect to hold until one is received. Familiarity with expected joining places and associated holding patterns is a must and should be accomplished during the planning phase.

One additional segment of airspace is that which is apportioned for the use of military training. Special use airspace for military crews exists throughout the European region. Reference to either high or low enroute charts will reveal these areas as roughly box-shaped and delineated by cross-hatch markings (see Appendix). All useful information is contained in boxes within each area; and if space does not permit, complete information is in the Special Military Use Airspace section of FLIP. Information given should include: the area designation (number); effective altitudes (or unlimited); operating times (continuous if no time is given); the weather conditions under which the area may be used, VMC or IMC; and the name of the controlling agency for that airspace. Usually used by the TAC and NATO forces for day to day training, aircraft transiting to and returning from these areas usually stay under military radar control all the way or receive advisories from these agencies. The military controllers are responsible for keeping them clear of civilian-controlled airspace and airways. SAC crews should not have any need to go to most of these areas as they are designed for, and used by, tactical fighter-type aircraft of US forces and NATO allies. Refueling areas used by SAC tankers, however, may be part of, or cross, several of the areas in the higher airspaces. Refueling areas are listed in AP/2, Chapter Eight.

ATC Management

Airways are controlled airspace corridors which join into terminal areas, also controlled, which exist around major civil and military airports. ATC is a must for the orderly, safe conduct of operations due to the multiplicity of users in such small areas. ICAO defines ATC service as: a service provided for the purpose of (1) preventing collisions, and (2) expediting and maintaining an orderly flow of air traffic. (4:40) Aircraft desiring to operate in positive control are required to meet certain restrictions to ensure this safe operation.

> Aircraft operating in controlled airspace must be capable of operating under IFR. . .the minimum equipment required in the aircraft for IFR flying is two-way radio communication, blind flying instruments, and navigation equipment which enable the pilot to fly without visual reference to the outside world. A further requirement is the filing of a flight plan. . . (4:41)

Even though primary and secondary surveillence radar (SSR) aid in the control of aircraft and are installed at aerodromes and enroute area control centers where traffic density warrant, flights are expected to be able to navigate the standard VOR/DME short range system. (10:4-2) Accepted system accuracies of $\pm 5^{\circ}$ (95% confidence level) should be assumed for planning purposes. (11:2-7)

Approach control service is provided at all international aerodromes equipped with navigation aids for instrument approach and landing. (10:4-3)

> Where approach control service is to be provided, controlled airspace, in the form of control zones, should be established so as to encompass the entire climb to cruising level of departing aircraft and the entire descent from cruising level of arriving aircraft. In terminal control areas and control zones, ATC service should be applied to all aircraft, including VFR traffic, in order to provide positive separation for aircraft executing arrival, departure, holding, and noise abatement procedures. (10:4-3)

Terminal area aids recommended by ICAO should permit navigation for approach, holding and departure to be carried out with the accuracy required. (11:2-8)

> As an aircraft approaches its destination, the sector controller clears the aircraft to commence descent. He supplies the aircraft with the inbound routing and runway in use at destination, liaisoning with the TCA arrival controller and then transferring control to the TCA controller. Where too many aircraft converge at once into the TCA they are ordered to queue, flying a racetrack shaped holding pattern off of a VOR. Successive aircraft are assigned flight levels separated by 1000ft starting at 5000ft or so. Control of the arriving traffic in the bottom of the stack is transferred to the approach control unit of the airport. Approach control withdraws aircraft from the bottom of the stack and the rest 'ladder' down, always maintaining the 1000ft separation. Approach control adjusts the path of each arriving aircraft to intercept the extended runway centerline at 2000-3000 feet and at a distance of 8-12NM from the threshold. (5:3-6)

For approach and landing, ICAO has determined that aids should

> take into account the following considerations to determine specific requirements: the aerodynamic and handling characteristics of the aircraft, their frequency of use at each aerodrome, and the aerodrome environment. Aids should be dictated by the need of turbo-jet powered air transport aircraft with fast approach speeds for precise lateral and vertical alignment with the runway. ILS is required at all aerodromes used on a regular basis by aircraft requiring such accurate descent and lateral guidance. (11:2-8)

The discussion thus far in this chapter is, of course, over-simplified. It does not do justice to the extreme degree of cooperation and flight information integration that takes place behind the scenes. The next chapter will deal with this integration, as characterized by the uniquely European military/civil ATC system.

Chapter Three

CIVILIAN AND MILITARY CONTROL

ICAO

European airspace has become a complicated network of air routes and control areas used by military and civilian operators of many kinds, often from the same facilities. Congestion in Central Europe, particularly where military bases exist so close geographically with civilian airports, puts a strain on air operations from both users. The militaries of the world are increasingly being forced to share larger and larger pieces of airspace with their civilian counterparts in the aviation world. It is important to keep in mind, as mentioned in Chapter One, that ATC is guided to some extent by the types of aircraft and operations conducted in its airspace. As we begin our discussion of the civil/military dichotomy of European ATC, we will first spend some time examining the ICAO itself, and the attendant agencies responsible for implementing ICAO Conventions in Europe.

The International Civil Aviation Organization is responsible for standardizing rules and regulations agreed upon by member nations. These rules cover all the aviation world, with exceptions taken by country. Article 38 of the Convention states that if any State does not comply in all respects with the standards and recommended practices adopted by the ICAO, it must immediately notify the ICAO of the differences between its own practice and that established by the international standards. (7:4) Militaries pattern their operating procedures after both ICAO rules and a country's national rules; and since military flights operate within civilian airspace, and often operate in accordance with General Air Traffic (GAT) rules, crews should be familiar with their country's national civil rules as well as they are the military regulations. The global nature of the USAF mission can truly complicate the sets of rules. ICAO, Article 3, states that the Convention only applies to civil aircraft. In the US, where the civilian sector controls the common system regulating both civilian and military flights, the FAA is charged with all air operations. AFR 60-16 "directs AF flights to comply with FAA regulations". (7:3) Additionally, AFR 60-16 supports the activities of ICAO and military mission permitting, complies with ICAO SARPS in international airspace over the high seas. Flight operations within the airspace of a foreign state should . . .conform to the rules and regulations of that state, and these rules are in turn likely to conform to the ICAO standards by reason of Article 38 of the Convention. (7:4)

Under the Convention, all included airspace is designated civil airspace. ICAO does not separately recognize military operators or military airspace. In nations that have common or dual ATC systems with civil agency jurisdiction, airspace allocated to the military is within overall civil responsibility, but is considered uncontrolled by ICAO. (12:30)

Also, AFR 60-28 expects the military to avoid conflicting with national regulations, but to conform to ICAO when in controlled airspace. Thus we can see that there is a close complimentary and interdependent relationship between the civil and military users. Since virtually any area of the world is a potential arena for conflict concerning US forces, US military flights abide by ICAO rules. (13:23) One of the impressive accomplishments of ICAO is in the form of statistical tribute to its standardization efforts - better than 90% of ICAO and US rules and operating principles are identical. (13:23)

ICAO conducts Regional Air Navigation Meetings (RAN) in each of the nine world regions to discuss and resolve problems of that region regarding air routes, nav/comm facilities, and ATC services. (7:5) The US air Force sends observers to these RAN's to ensure that the military interests of that region are considered. (7:6) USAF also maintains a link between US ATC management personnel and foreign aviation planning groups.

Europe has devised a system of several working groups to combat the complexities of that region. The principle agency coordinating the efforts of NATO countries is the Committee for European Airspace Coordination (CEAC), composed of high ranking military and civilian representatives from member NATO countries. Some of the principle duties of CEAC include: coordination of all major NATO exercises; updating and coordinating with civil authorities regarding navaids/comm facilities; and ensurance of maximum civil/military integration. (4:42) Additionally, there exists the organization called EUROCONTROL, whose function is more specialized as sole administrator of enroute services in the upper airspace of member states (usually CAT flying IAW ICAO rules above 25,000ft).

However, due to political reasons, this supranational organization never fulfilled its intent, and today operates the Upper Air Control Centers (UAC) out of Maastricht (Netherlands) and Karlsruhe (Germany), which control a sizeable piece of northwest European airspace. (13:43) Maastricht UAC provides ATC in the upper regions over Belgium, Netherlands, Luxemborg (BENELUX); and N. Germany; Karlsruhe UAC controls S. Germany. Both centers are closely linked to NATO air defense. In the Benelux, military operations are controlled by military controllers, except over N. Germany where military ATC is itself located in the Maastricht facilities. The Karlsruhe Center has already integrated its civil/military control of upper airspace. (1:703) CEAC is required to deal with each member nation on an individual basis on matters regarding lower airspace. The US is a member of CEAC, but is limited to "observer only" status with EUROCONTROL.

This general introduction to the complexities of ICAO and its various agencies will serve us as we begin to explore the further complex nature of the integration necessary for the dual civilian/military system to work.

EUROPEAN AIRSPACE CONTROL

European Airspaces and Rules

As an introduction to the subject of military and civilian control of the airspace, it will be interesting to briefly mention something about the airspaces of some of the better known countries. As we mentioned earlier, coordination problems between countries can exist, for many reasons, despite the efforts of ICAO. One simple reason would be physical communication lines problems; another would be control/computer data base differences which could even cause (rarely) erroneous duplication of some vital flight information. Another reason is that each country's airspace can be just plain different. FLIP AP/2 has some general rules for flying in the European region. IFR is standard, except as noted on page 3-1 of the National Supplement procedures. Also in AP/2, flight crews can locate on page 3-3 a chart indicating upper airspace centers which will be helpful when planning points of transit country to country (see Appendix 5). See the specific country information (listed in AP/2) where the applicable airspace center is located for flight plan information.

There are basically two ways to file a flight plan, "GAT" and "OAT". General Air Traffic (GAT) is probably more similar to what we would call "IFR" in the US - it consists of IFR flights operating in controlled airspace and along controlled airways, such as civil carriers. Military transports usually operate under GAT. For military aircraft who cannot adhere to the GAT ICAO standards, usually due to equipment limitations or mission requirements, Operational Air Traffic (OAT) exists. Since the OAT/GAT rules vary a little country to country, AP/2 should be consulted. For those countries with controlled airspace, GAT is the ICAO standard in the upper airspaces. Since most military bases lie in airspace not controlled by civil radar but by military radar, it is often common to use a mix of OAT/GAT, with the changeover points identified on the DD1801 flight plan via some navaid. (Such information should go in the remarks section of the DD1801.) Additionally, some military bases have OAT climbs and departures which should be used; if not available, use OAT/GAT and state your intentions to use OAT upon contact with the departure controller. One note, however; OAT aircraft will not be allowed to cross an airway during a climb. (9:AP/2)

As mentioned earlier, flying between countries can be a problem due to rules changes, airspace changes, and ATC coordination problems. FLIP AP/2, Chapter Three, contains the following information and has highly detailed specifics for flying in each country. The following countries are examples indicating the complexity involved in flying the European region. In Italy, for example, there is no enroute radar for monitoring or controlling traffic; the only radar is owned by the military. Conventional (time/speed) spacing is used, along with standard position reporting procedures (see back cover of ENAME), and crews may expect delays due to poor communications and information processing. In Germany, it becomes quite complicated. Upper air routes are between FL245 and FL460, and controlled by either Maastricht or Karlsruhe Upper Air Centers. All traffic on civil ATC routes is GAT and controlled by civil authorities. OAT is for those unable to use GAT, and is conducted outside the civil ATC routes, and controlled by military radar. France has mandatory IFR above FL195 and along airways, where GAT is IAW ICAO for all civil/military flights. Aircraft below FL195 and equipped with UHF only must file OAT, and are controlled by a French military controller. France has four categories of OAT (A, B, C, D) depending on the degree of radar control, and some complicated transit rules when entering French airspace from Spain or Italy. See AP/2, Chapter Three for details. The United Kingdom has served as host to SAC tanker TDY crews for years and has the most familiar, albeit complicated, system. Mandatory Radar Service Areas exist between FL245 to FL660 where flight crews must be in contact with the appropriate ATC facility for that region. Included in the areas, however, can be upper military training areas where aircraft may not be under any radar control. Middle airspace is from FL100 to FL245 outside controlled airspace, and again only radar advisories are available. Lower airspace is from 300ft AMSL to

FL100 outside controlled airspace, and again has only radar advisory service. All civil airways and upper routes are GAT only. Military aircraft are encouraged by FLIP to use OAT routes wherever possible to improve ATC coordination between military/civilian controllers when above FL 245. When operating OAT below FL95, expect radar services only in controlled airspace; in fact, OAT below FL95 is not recommended due to lack of services. AP/2, pg 3-3 shows a chart containing airspace available to OAT traffic. Since most military bases are located in uncontrolled airspace, positive separation from unreported aircraft is not guaranteed. FLIP AP/2 reports incidents of midair collisions run around 60% probability below 3,000 feet; 20% from 3,000 to FL80; and 15% from FL80 to FL250. (9:3-122) A reminder from FLIP AP/2 that when departing uncontrolled airspace to join an airway, crews will need a "clearance to join" at least 10 minutes prior to their ETA at the entry point, and must remain clear until received. (9:3-21) The military controller will issue instructions or transfer the flight to the civil controller, who will then issue instructions.

As can be seen, even AP/2 can be complex and require much attention. The only reasonable, safe way to effectively operate within the air rules of any country is to prepare, and that means mission planning.

Control of the Airspace

We've already touched on some complex civil/military coordination problems simply from the standpoint of airspace management. Most European countries have a dual ATC system with civilian and military controllers each controlling assigned portions of airspace, with a few countries having a fully integrated system of predominantly civil control (such as in the US). In such systems, the military controls traffic in its own airbase airspace as has been assigned by ATC. See Appendix VI for a compilation of ATC control authority by country.

ICAO has recognized the problem of coordination between civil and military users for a long time. In 1981 it published an Air Nav Plan which addressed air traffic services (Part II), and devoted an entire section to "Civil-Military Coordination" discussing such instances as: penetration of each other's airspace; clearances; coordination and liaison; air defense; and separation standards. In concluding Section 2, ICAO wrote "when developing the plans for its future ATC system, give prime consideration to the creation of a single civil/military ATS system capable of meeting the requirements of both categories of users in the most effective manner". (10:E-2) The European coordination problem is further exacerbated by the nature of the confined, dense traffic system of the European continent. As discussed in Chapter Two, ATC boundaries can at times follow national boundaries creating crew task burdens and ground controller (country to country) complications, not just civilian or military. ICAO has attempted to reduce these instances to a minimum.

Historically, the US, since the end of World War II, has played the leader's role in upgrading much of Europe's equipment and operating procedures. The common civil/military FAA-run system of the US is a model that ICAO would like to see implemented by all member states in the future as evidenced by the statement from ANP 1981. In the US system, military aircraft are treated just like civil aircraft (GAT) during enroute flights to and from military special operating airspaces, where there they practise air-to-aid tactics, the weapons ranges exist, bombing runs are made, etc.. (12:14) In this set-up, enroute airspace is controlled by civil agencies. "Most European countries operate either civilian or military long range radars, often in coordination with air defense; and all countries operate terminal radar except Greece, Turkey, and Poland (terminal radar exists at all US military installations)". (12:42)

European dual system countries have the civil-designated airspaces, airways, and terminal areas controlled by civil authorities; while the military half (closely aligned/coordinated with air defense) has control of airbase traffic areas, and airspace "between, over or under civil airspace". (12:36) As discussed earlier, military traffic departing a base will be controlled by military authorities who give advisories and avoidance vectors until the aircraft enters civil airspace, in which case control may be passed to civil authorities. Military ATC must keep the aircraft clear of civil traffic at all times, coordinate clearances across, and joinups with, civil airways, and coordinate passage of control to civil authorities when civil airspace is joined. These assignments are primarily duties performed in congested terminal areas and in common civil/military use airspaces or when joining civil airways. In airspace used only by military personnel (OAT), the duties are identical except for civil coordination needs which are unnecessary. Terminal areas can be a problem, however, especially where military and civil bases are closely aligned. Military authorities in most countries handle the terminal airspace problems for both civil and military users, even in the US where civil users often approach and depart in military-controlled airspace. (12:16)

In Europe, the military ATC system is differentiated from the civil mostly by the control and advisory services provided by the ATC/GCI sites. (12:14) As mentioned previously, military controllers are closely aligned with the NATO air defense and intercept controllers. These GCI controllers have two tasks: air defense, and control of military OAT traffic in military airspace. (12:14) ICAO only has control over GAT traffic. This is different from the US system where there is no "enroute" military airspace, and all enroute airspace is civil.

The civil system is differentiated by two major characteristics: (1) the preponderance of operations are point-to-point, and (2) most civil training operations are conducted in local airspace. (12:16) Military aircraft flying as GAT in Europe are just another point-to-point flight, and no differentiation is made until arrival in the terminal area where military ATC often assumes control over all traffic (civil and military) anyway. It can thus be seen, that the two systems although separate, are not really separate, but closely intertwined. With control and coordination problems as critical as they are, is there justification for a continued dichotomy and delay of the ICAO call for a unified system?

Future Implications

There has been resistance in the NATO countries to integrate. This creates monumental planning and flow control problems for CEAC, which must manage the joint civil/military use of the common airspace. (12:173) Obviously, neither the civil nor military wishes to relinquish whatever airspace it now controls; indeed, the military feels it is being squeezed out of the picture, as its tactical operations must be confined to smaller and smaller airspaces. (12:180) The military transports pose no large problem, as they can be integrated into the civil GAT system quite easily under point-to-point criteria. It's important, however, that the future needs of tactical military users be examined critically, and that CEAC consider their unique needs as relates to the air defense of NATO. Obviously, military air training operations cannot be squeezed out entirely and still maintain a strong arm in NATO forces. Yet, the coordination dilemma requires attention to streamlining. ICAO has already called for unification. "Most improvements we see today are to accomodate the needs of civil users, thus causing the military to adapt either in terms of airspace concessions, or equipment modifications." (12:180)

It is difficult to envision just what our NATO airspace needs will be in the future. We do know that the present civil/military system of Europe, although working now, probably will be forced to change to accomodate its two principle users. Adoption of a single, common manager of the enroute structure, similiar to the FAA-run US system, containing special purpose military airspace for training, would be the most viable option. The NATO air defense factors cannot be ignored in this process, are critical to the mutual defense of the NATO countries, and form the greatest of impediments to any relinquishing of military control of the skies. Just provision for NATO air defense is a prime consideration, and needs to be addressed in view of the close, confined and congested nature of the European airway region.

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APPENDICES

1. Appendix I — DD 1801 International Flight Plan
2. Appendix II — Airways Legend of Symbols
3. Appendix III — Low Airway Structure
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5. Appendix V — Upper Airspace Centers
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7. Appendix VII — ICAO Regional Chart

APPENDIX I

DD 1801 INTERNATIONAL FLIGHT PLAN

DOD INTERNATIONAL FLIGHT PLAN

15 [illegible] ROUTE

NOT FOR TRANSMISSION

TYPE OF EQUIPMENT

LIFE JACKETS

POLAR → DESERT → MARITIME → JUNGLE → GLOBAL → JACKETS → LIGHT → [illegible]

DINGHIES [illegible] COLOR [illegible] COVER [illegible] TOTAL CAPACITY

DINGHIES → COVER → RMK/) <≡

REMARKS

CREW LIST ☐ ATTACHED ☐ LOCATED AT:

PASSENGER MANIFEST ☐ ATTACHED ☐ LOCATED AT:

AIRCRAFT HOME STATION OR ORGANIZATION | NAME OF PILOT IN COMMAND: INSTRUMENT RATING | SIGNATURE OF PILOT IN COMMAND OR DESIGNATED REPRESENTATIVE

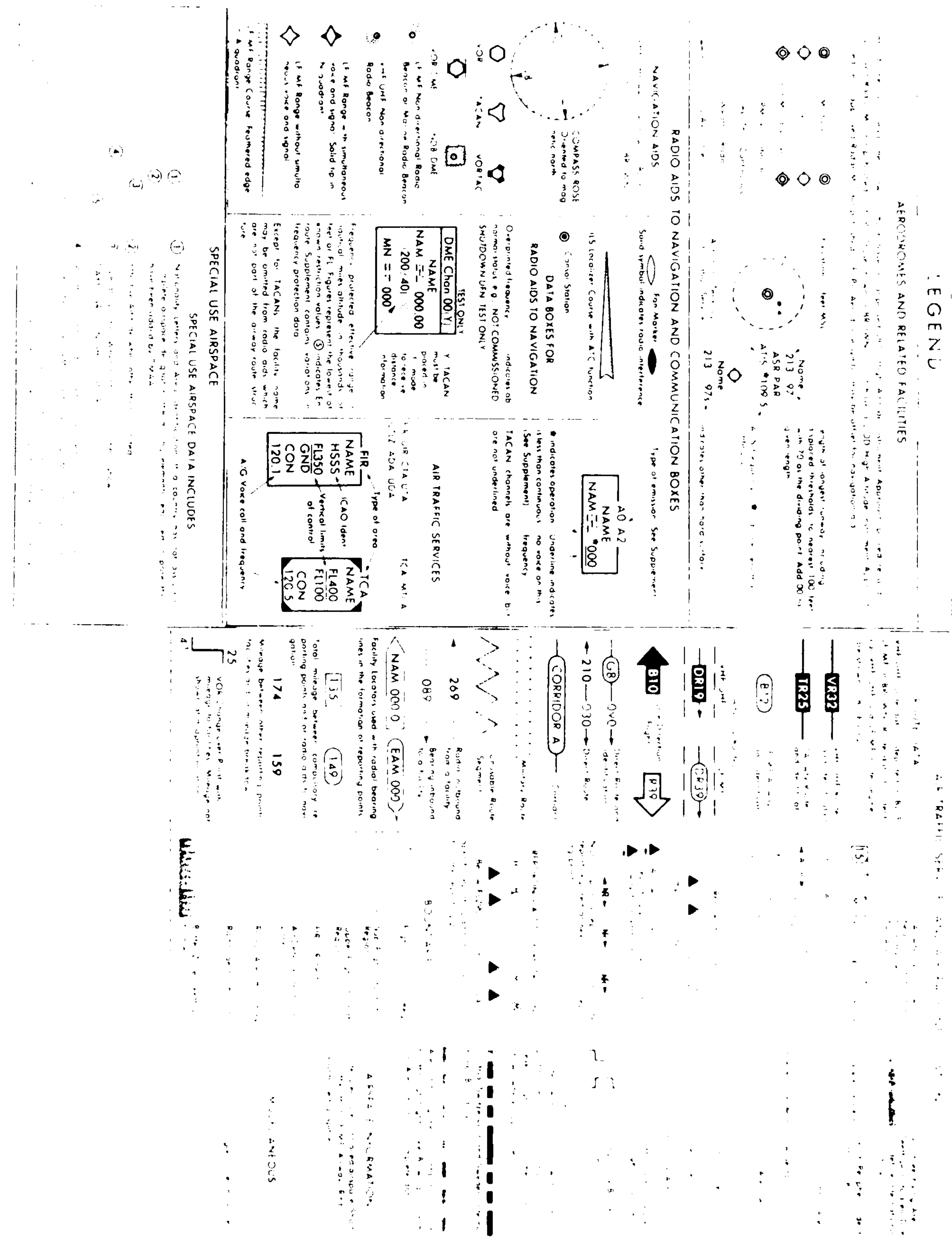
	PILOT'S PREFLIGHT CHECK		BASE OPERATIONS USE			APPROVAL
	NOTAMS		CURRENT [illegible] CARD	F		[illegible]
	AIR SPACE RESTRICTIONS		SPECIAL BRIEFINGS	P		
	AIRCRAFT/DEST NAV AIDS		DIP CLNC/US CODE/PPR	L		
	WEATHER AND WINDS		82 FLT/GAT/OAT	T		MISSION CONTROL AUTHORITY
	SIDE FLIPS AND CHARTS		VIP CODE BLOCK TIME	A		
	FLIGHT PLAN LOG		PAX MANIFEST	T		
	POPPY SEED REPORTS		CUSTOMS FORM	W		
	FOREIGN CLNC GUIDE		FLT ORDERS OR CREW LIST	R		
	COMMAND LOCAL DIRECTIVES		FUEL REQUIREMENTS			[illegible] AUTHORITY

DD FORM 1801

Reprinted DD Form 1801

APPENDIX II

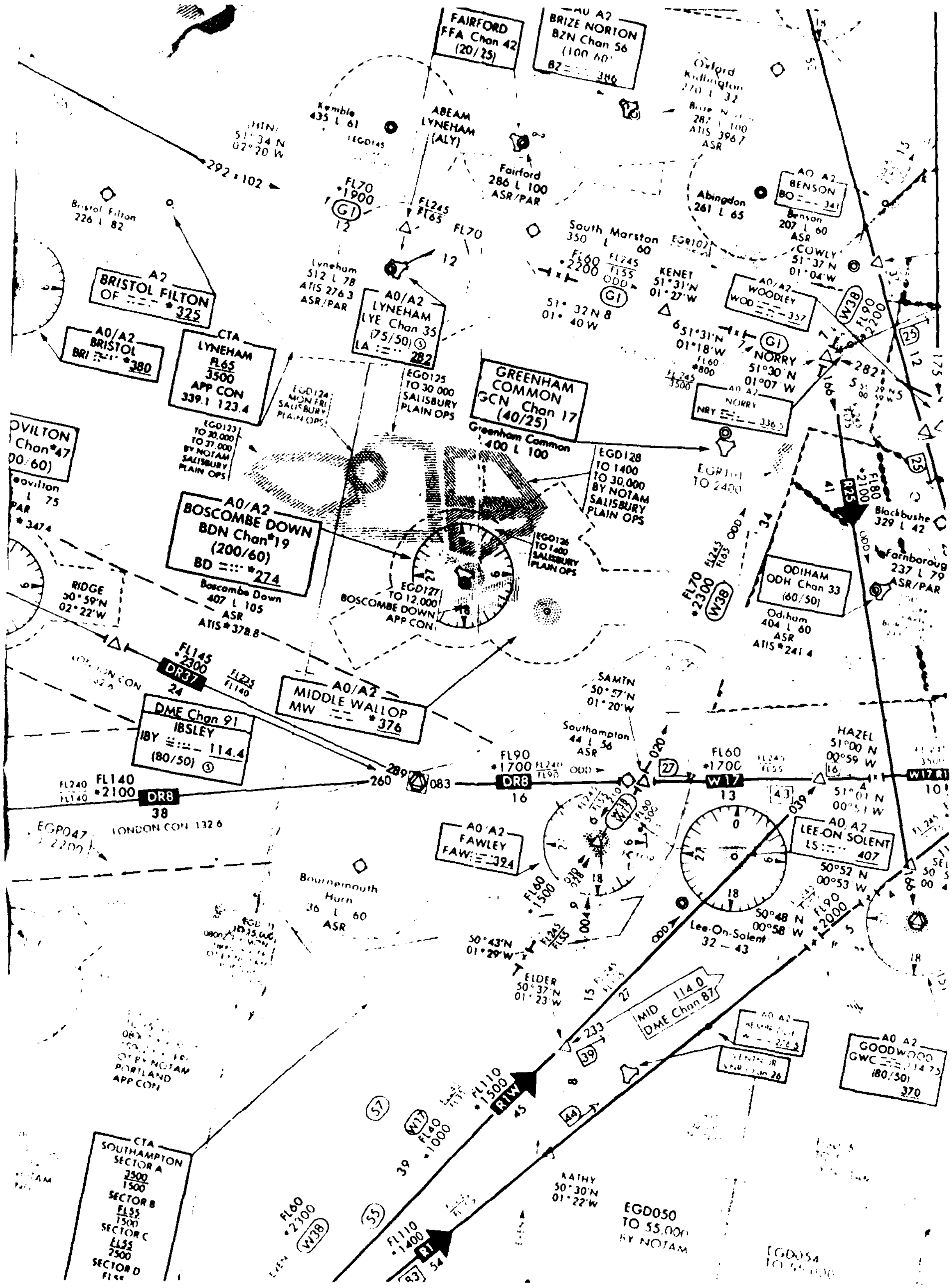
LEGEND OF AIRWAYS SYMBOLS



Reprinted from enroute charts

APPENDIX III

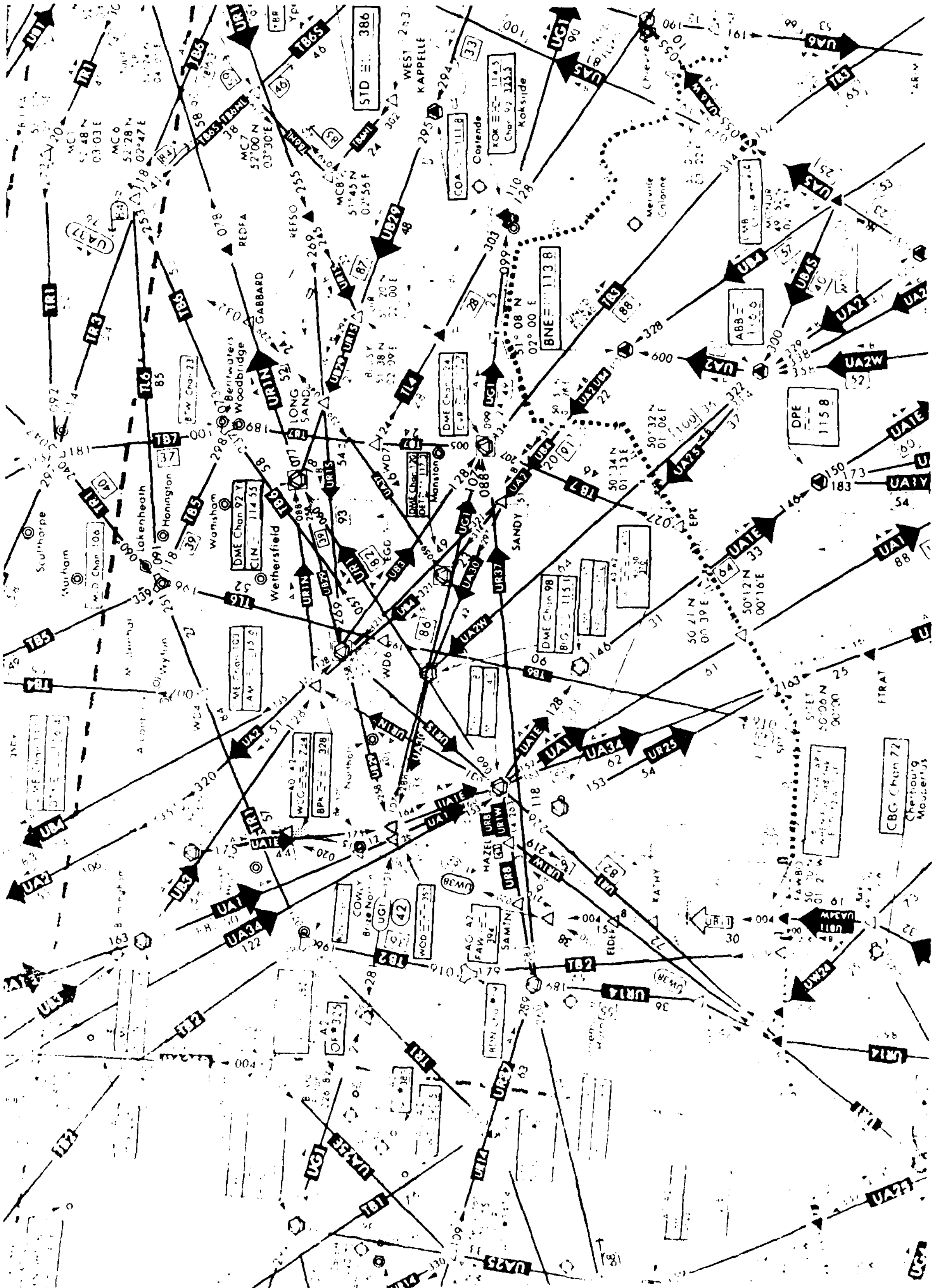
LOW AIRWAY STRUCTURE



Reprinted from low enroute chart

APPENDIX IV

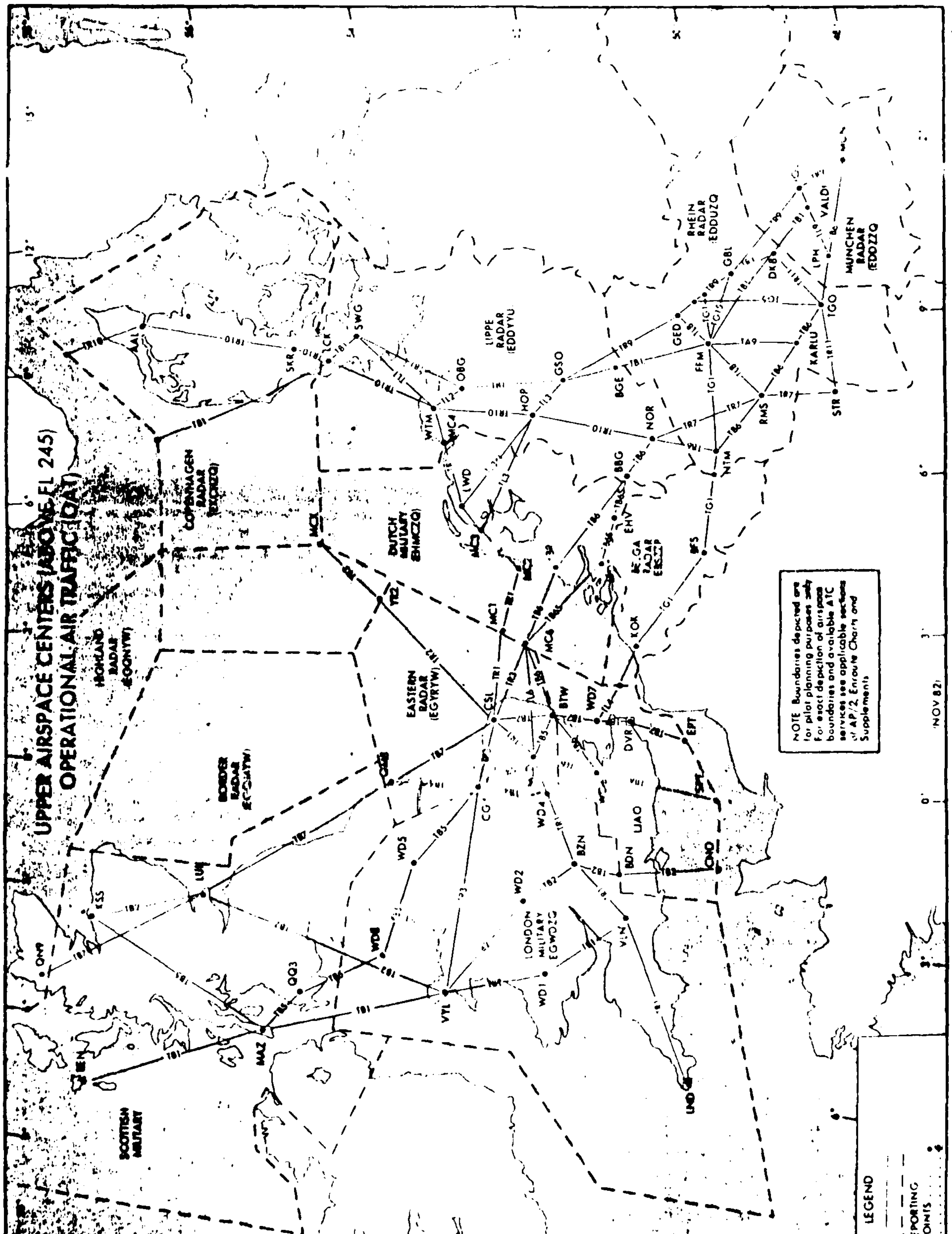
HIGH AIRWAY STRUCTURE



Reprinted from high enroute chart

APPENDIX V

UPPER AIRSPACE CENTERS



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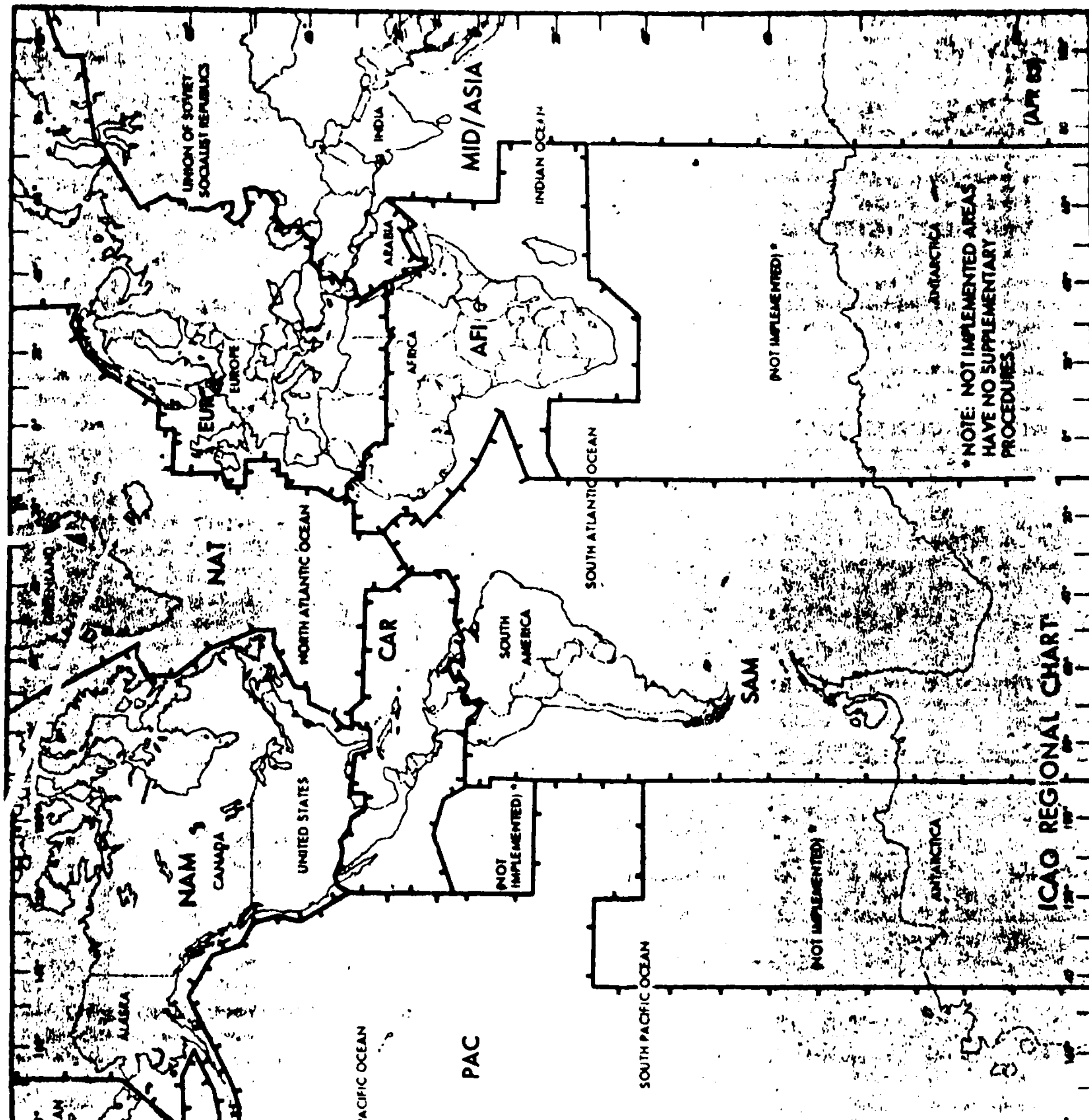
APPENDIX VI

INDEX OF AIRSPACE CONTROL AUTHORITY

Country	ATC AUTHORITY		
	Civil	Military	Dual
Benelux			X
France			X
West Germany			X
Italy		X	
Netherlands			X
Spain			X
United Kingdom			X
Canada	X		
United States	X		
Greece		X	

APPENDIX VII

ICAO REGIONAL CHART



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