NAT IGA

North Atlantic

International General Aviation

Operations Manual

Third Edition

Version 2.1 – 2004

Prepared by the United States

FOREWORD

This manual was initially developed by the North Atlantic Systems Planning Group (NAT-SPG) to assist international general aviation (IGA) pilots with flight planning and operations across the North Atlantic. It is now updated and maintained by the North Atlantic Operations Managers (NAT OPS MGRs). It is not intended to be a detailed listing of procedures or air regulations of the various States that provide air traffic service in the North Atlantic (NAT) region, and does not in anyway replace the information contained in various national Aeronautical Information Publications (AIP's). Pilots must consult relevant AIPs and Notices to Airmen (NOTAMs) when planning the flight and prior to departure. If you have any questions, comments, or suggestions regarding this manual, contact Michael Pumphrey, International Operations Manager for the FAA Eastern Region and New York Center at 631 468-1037 or via email at michael.pumphrey@faa.gov.

Appendix 1 provides information on obtaining regulatory publications that may be of assistance to you. **This manual is for flight operations above and below minimum navigation performance specifications (MNPS) airspace. If you are going to fly within or above MNPS airspace, refer to the MNPS Guidance Material.**

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INTRODUCTION

General

Flights by general aviation aircraft across the North Atlantic have increased dramatically. Unfortunately, there has been a corresponding increase in the number of general aviation fatalities and aircraft lost. Because of the harsh climate, lack of ground-based radio and navigational aids, as well as the immense distances involved, **a trans-Atlantic flight is a serious undertaking**. While IGA flights constitute a relatively small percentage of the overall North Atlantic traffic, they account for the vast majority of search and rescue operations and expenses. The information contained in this manual is intended to assist the IGA pilot in completing a safe flight.

Within the NAT Region there are both civil and military air traffic operations. The civil operations include supersonic commercial flights, a significant volume of subsonic commercial traffic, as well as an increasing number of IGA aircraft. In addition to routine trans-Atlantic military air traffic, at least twice annually large-scale joint force military operations are conducted. These operations may restrict access by general aviation to portions of North Atlantic airspace.

The NAT Region is comprised of the following flight information regions (FIRs) and control areas (CTAs):

Bodø Oceanic
Gander Oceanic
New York Oceanic
Reykjavik Oceanic
Santa Maria Oceanic
Shanwick Oceanic
Sondrestrom

DEFINITIONS OF TERMS

AERONAUTICAL INFORMATION PUBLICATION (AIP)
A publication issued by or with the authority of a State and containing aeronautical information of a lasting character essential to air navigation.

ARINC
A corporation largely owned by a group of airlines, and licensed as an aeronautical station. ARINC is contracted by the FAA to provide communications support for air traffic control and meteorological services in portions of International (usually oceanic) airspace.

AERONAUTICAL TELECOMMUNICATION STATION
An aeronautical station which forms part of a radio telephone network by providing air/ground communications and flight information service as an integral part of air traffic services. Aeronautical Telecommunication Stations - An are also known as International Flight Service Stations, Aeronautical Radio or Aeradio Stations depending on the State providing the service.

AIR ROUTE TRAFFIC CONTROL CENTER (ARTCC)
A U.S. term for a facility established to provide air traffic control service to aircraft operating on IFR flight plans within controlled airspace, principally during the en route phase of flight. When equipment capabilities and controller workload permit, certain advisory/assistance services may be provided to VFR aircraft. An ARTCC is the U.S. equivalent of an Area Control Center (ACC).

AIR TRAFFIC SERVICES (ATS)
A generic term meaning variously, flight information service, alerting service, air traffic advisory service, air traffic control service, area control service, approach control service, or airport control service.

AREA CONTROL CENTER (ACC)
An ICAO term for an air traffic control facility primarily responsible for providing ATC services to IFR aircraft in controlled areas under its jurisdiction. An ACC is the international equivalent of an ARTCC.

AREA NAVIGATION (RNAV: LORAN C, INS, GPS, etc.,)
A method of navigation which permits aircraft operation on any desired flight path within the coverage of station-referenced navigation aids, or within the limits of the capability of a self-contained navigation system, or a combination of these.

CONTROL AREA (CTA)
A controlled airspace extending upwards from a specified limit above the earth.

FLIGHT INFORMATION CENTER (FIC)
A unit established to provide flight information service and alerting service.

FLIGHT INFORMATION REGION (FIR)
An airspace of defined dimensions within which flight information service and alerting services are provided.

FLIGHT INFORMATION SERVICE (FIS)
A service provided for the purpose of giving advice and information useful for the safe and efficient conduct of flights.

FLIGHT LEVEL (FL)
A surface of constant atmospheric pressure which is related to a specific pressure datum, (i.e., Standard Pressure- 29.92' a Hg or 1013 HP), and is separated from other such surfaces by specific pressure intervals. Each is stated in three digits that represent hundreds of feet, (i.e., FL060 = 6000 feet).

GLOBAL POSITIONING SYSTEM (GPS)
A space based radio positioning, navigation and time transfer system. GPS provides highly accurate position and velocity information, on a continuous global basis to an unlimited number of users. The system is unaffected by weather and provides a worldwide common grid reference system. The GPS receiver automatically selects appropriate signals from the satellites in view and translates these into three-dimensional position, velocity, and time. System accuracy for civil users is 100 meters horizontally.

HIGH FREQUENCY COMMUNICATIONS (HF)
High radio frequencies between 3 and 30 mHz used for air/ground voice communications in overseas operations. HF is required for all IFR operations in controlled airspace when out of the range of VHF communications. If in doubt as to the VHF coverage along your intended route of flight, the aircraft should be equipped with HF.

INTERNATIONAL CIVIL AVIATION ORGANIZATION (ICAO)
A specialized agency of the United Nations whose objective is to develop the principles and techniques of international air navigation and to foster planning and development of international civil air transport.

INTERNATIONAL GENERAL AVIATION (IGA)
All international civil aviation operations other than scheduled air services and non-scheduled air transport operations for remuneration or hire.

INSTRUMENT METEOROLOGICAL CONDITIONS (IMC)
Meteorological conditions expressed in terms of visibility, distance from clouds, and ceiling which preclude flight in compliance with the Visual Flight Rules.

LIGHT AIRCRAFT
Aircraft with a maximum certified takeoff weight of 12,500 lbs. (5,700 kilos) or less.

MINIMUM NAVIGATION PERFORMANCE SPECIFICATIONS (MNPS)
A specified set of minimum navigation performance standards which aircraft must meet in order to operate in MNPS designated airspace. In addition, aircraft must be certified by their State of Registry for MNPS operation. The objective of MNPS is to ensure the safe separation of aircraft and to derive maximum benefit, generally through reduced separation standards, from the improvement in accuracy of navigation equipment developed in the recent years.

MINIMUM NAVIGATION PERFORMANCE SPECIFICATION AIRSPACE (MNPSA)
A portion of the NAT airspace between FL285 and FL420 extending between latitude 27°N and the North Pole, bounded in the east by the eastern boundaries of control areas Santa Maria Oceanic, Shanwick Oceanic and Reykjavik, and in the west by the western boundary of CTA Reykjavik, the western boundary of CTA Gander Oceanic and the western boundary of CTA New York Oceanic excluding the area west of 60°W and south of 3830°N.

NOTICE TO AIRMEN (NOTAM)
A notice containing information concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to personnel concerned with flight operations. NOTAMs are distributed via two methods: telecommunications (Class I) and/or postal services (Class II).

OCEANIC AREA CONTROL CENTER (OAC)
Any Area Control Center (ACC) with jurisdiction over oceanic airspace for the purpose of providing Air Traffic Services. Responsibility for the provisions of ATS is delegated to various States based primarily upon geographic proximity and the availability of the required resources.

OCEANIC AIRSPACE
Airspace over the high seas, for which ICAO delegates responsibility for the provision of ATS to various States.

REDUCED VERTICAL SEPARATION MINIMA (RVSM)
RVSM separation minima is 1000 feet vertical separation, usually between FL290 and FL410. Aircraft must be RVSM-approved to operate in RVSM airspace. All MNPS airspace is also RVSM airspace.

VERY HIGH FREQUENCY (VHF)
The frequency band between 30 and 300 MHz. Portions of this band, 108 to 118 MHz are used for certain NAVAIDS, while 118 to 136 MHz are used for civil air/ ground voice communications.

VISUAL METEOROLOGICAL CONDITIONS
Meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling, equal to or better than specified minima.
NOTE- *The specified minima are contained in Annex 2, Chapter 4*

Chapter 1 - Description of Airspace

General

The manual is designed for the IGA pilot planning a flight across the North Atlantic. The portion of the airspace addressed by this manual, along with the associated Flight Information Regions, is depicted in Chart 1. It is primarily concerned with airspace located north of 27° North Latitude, below FL285 and above FL420. The airspace between FL285 and FL420 in most of the North Atlantic is designated as Minimum Navigation Performance Specification (MNPS) airspace. A manual specifically detailing MNPS airspace and operations, the North Atlantic MNPS Airspace Operations Manual, is also available. Annex 1 provides information on how to obtain an MNPS Operations Manual.

Most of the airspace in Oceanic FIRs/CTAs is high seas airspace within which the International Civil Aviation Organization (ICAO) Council has resolved that rules relating to flight and operations of aircraft apply without exception. The majority of the airspace is also controlled airspace, and instrument flight rules (IFR) apply to all flights in oceanic airspace when at or above FL060 or 2000 ft. (600 m) above ground level (AGL). whichever is higher, even when not operating in instrument meteorological conditions (IMC).

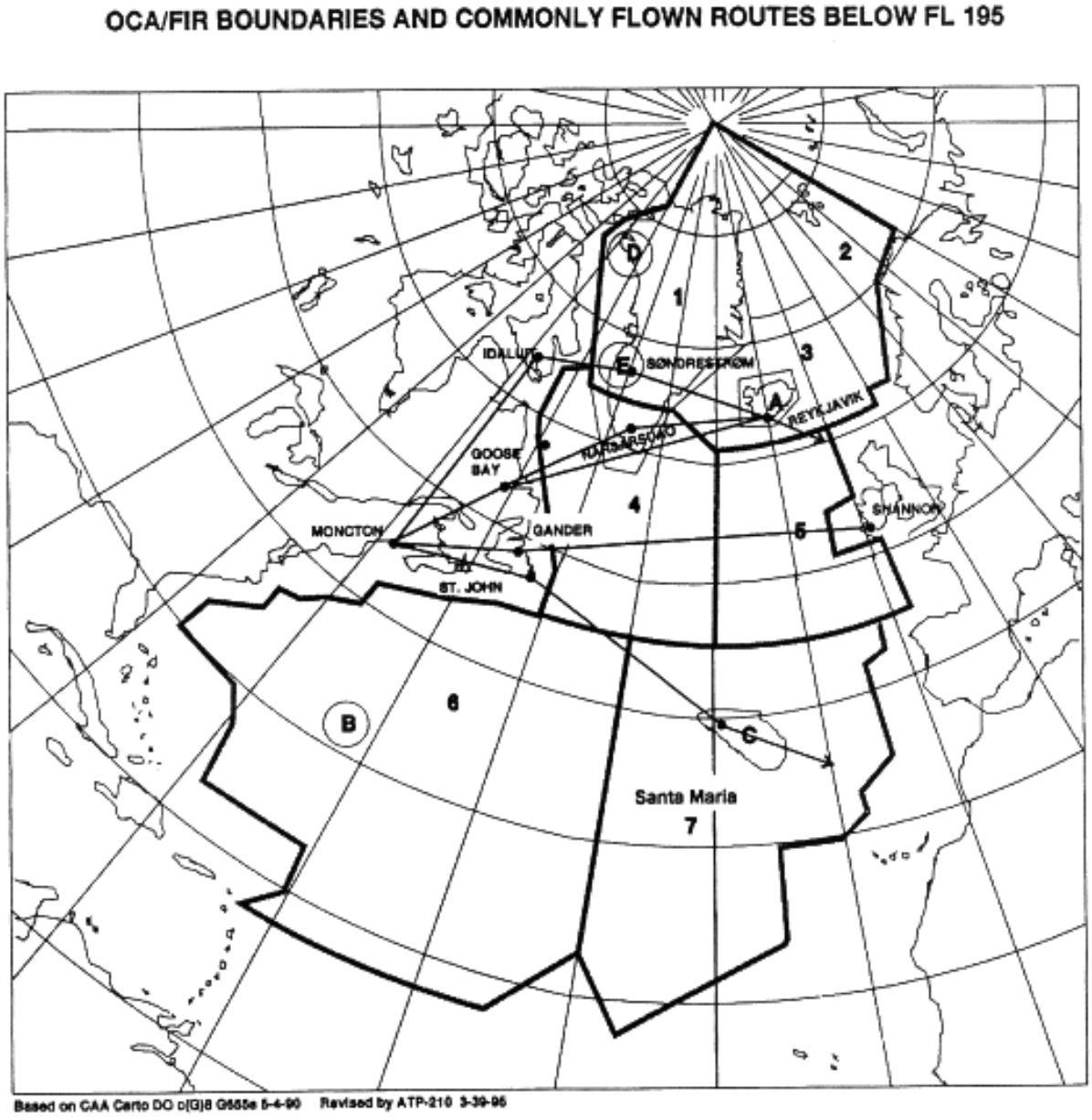
This controlled airspaces include:

1. New York Oceanic, Gander Oceanic, Shanwick Oceanic, Santa Maria Oceanic, Bodø Oceanic above FL195 and Reykjavik FIRs/CTAs;
2. Bodø Oceanic FIR/CTA when operating more than 100 NM seaward from the shoreline;
3. Sondrestrom FIR/CTA when operating outside the shoreline of Greenland:
4. Reykjavik FIR/CTA when operating in the Oceanic Sector, or in the Domestic Sector at or above FL200.

Commonly Flown Routes

The routes most regularly used by general aviation aircraft are depicted on the next page as Chart # 1, and are described in detail in the "Route Planning" section of this manual.

Chart #1



OCAs/FIRs
1. Sondrestrom
2. Bodo Oceanic
3. Reykjavik
4. Gander Oceanic
5. Shanwick Oceanic
6. New York Oceanic
7. Santa Maria Oceanic

TMAs
A. Reykjavik Domestic
B. Bermuda
C. Santa Maria
D. Thule
E. Sondrestrom

***NOTE**: Traffic above FL 195 in Sondrestrom FIR is controlled by Reykjavik and Gander*

Chapter 2. Environment

GENERAL

Extreme seasonal weather variations exist in the North Atlantic. Rapidly changing weather conditions involving severe icing, severe turbulence, and heavy precipitation are common, particularly in winter. Changes are often so rapid that they are difficult, if not impossible, to forecast. These harsh weather conditions, along with the rugged terrain and sparsely populated areas, will undoubtedly create problems for an ill-planned flight. Proper preparation, including route and emergency situation planning, will go a long way toward successful completion of your flight. Familiarization with all aspects of your emergency/survival equipment is vital if you are to survive an unexpectedly early termination of your flight. The following section, "Meteorology", is provided in order to assist in your understanding of rapidly changing weather in the North Atlantic.

METEOROLOGY

General

This portion of the manual is concerned primarily with the North Atlantic Region north of 27°N. This is the main "fly-way" between North American and European/Northwest African terminals. The weather problems on these routes are produced mainly by frontal depressions. Hurricanes and tropical storms affect the southern regions of the North Atlantic particularly in the Caribbean sector and the area between Cape Verde and the Leeward and Windward Islands.

Semi-permanent Pressure Systems

The Azores or Bermuda High is a region of subsiding warm air, usually oriented in an east-west line near 30°N in the winter and about 40°N during the summer. This high reaches its peak intensity in the summer months.

The Icelandic Low is a feature of the mean pressure charts of the North Atlantic in the winter. It is the result of frequent low pressure systems which, after deepening off the east coast of North America, move into the Iceland region.

The statistical average will show low pressure, but on a daily chart it may not even exist. On occasions the subtropical high is greatly displaced. This alters the main storm track resulting in abnormal weather conditions over large sections of the Atlantic.

Migratory Pressure Systems

Most in-flight weather is produced by frontal depressions. The North Atlantic is a region where new storms intensify or old storms redevelop. New storms may form off the Atlantic Seaboard and intensify as they move north-eastward across the ocean. These storms in particular are most intense in the winter months and have a wide variation in their tracks. Hurricane force winds may be expected near the surface. Sudden deepening of the depressions or changes in the estimated tracks can cause dramatic changes in upper air winds and consequently serious errors in wind forecasts. Winter storms over the North Atlantic should lead to extra careful planning of flights.

Sometimes storms develop west of the Azores and move northward or north-eastward toward Iceland and the United Kingdom. These storms are usually associated with warm highs over western Europe.

Secondary lows often develop west of Greenland when a low moves northeastward across the southern tip. These lows in the Davis Strait-Baffin Bay area result in poor weather conditions in the southeastern Arctic; with the tracks of the main low pressure systems. Lying to the south of Greenland and Iceland from east to west towards Scotland, cold and often stationary lows form frequently over the Greenland Sea between Iceland and South Greenland. Although these lows are without typical frontal zones, active CB-clouds with snow showers often tend to join into the "semi-front" with continuous snowfall. The same happens in the so-called polar-lows which during winter may develop in arctic air masses around Iceland and between Iceland and Norway.

Tropical storms and hurricanes originate in the Caribbean or eastern Atlantic during the late summer and early fall. They often curve northward around the Bermuda High onto the northern portions of the Atlantic producing severe in-flight and terminal weather.

High pressure areas found over the Atlantic have a variety of paths. Those that move eastward off the North American continent are usually cold domes. In winter these weaken or disappear entirely after they reach the warmer waters of the Gulf Stream. During the summer they generally merge with the Bermuda-Azores High. Occasionally, a high moving eastward off the Labrador coast will continue to build up for two or three days and spread more or less straight eastward to Europe.

Another important facet of the North Atlantic is the effect of the Siberian High. In winter this high may extend southwestward so that its western point reaches across northern Europe and out over the northeastern Atlantic. On rare occasions this high may dominate the entire region of the North Atlantic from Greenland to Europe.

The Azores low is a development that is most widely divergent from the normal conditions. During periods of meridional flow, cold air from northern Canada will advance well southward into the region between Bermuda and the Azores, breaking away from the main body and causing a cold low to develop in that region. These lows usually move very slowly and can become extensive. At the same time high pressure may build up to the Iceland area producing easterly winds over the entire region north of 30N.

On occasions an extensive high pressure area builds up over Europe. This blocks the eastward motion of lows and forces them to curve northward, resulting in the trough over the eastern Atlantic. A ridge then develops in the mid-Atlantic. This ridge in turn blocks lows moving off North America and causes a trough to form near the east coast. These troughs and ridges may persist for days with little motion. In the trough, lows develop, deepen, move northward, and occlude. Development of these low pressure systems is often very rapid, causing sudden, unpredictable weather to occur. One of the most treacherous situations for eastern Canadian terminals occurs when lows deepen or form rapidly south of the Maritimes with a trough northward over the Gulf of St. Lawrence and Labrador.

Upper Air Circulation

The main flow is generally from west to east but many variations do exist. The winds are stronger in winter when greater horizontal gradients exist. Inevitably, the strongest winds will be located in the western Atlantic. As the air masses traverse the oceanic area. considerable modification occurs resulting in weaker thermal gradients, producing lighter winds over the eastern Atlantic.

Air Masses

The air masses usually found over the Atlantic are those that have moved across the eastern U.S., or southeastward across Canada or the Davis Strait. As these air masses move out over the Atlantic they rapidly assume maritime characteristics. The greatest change in these air masses occurs while crossing the Gulf Stream or the North Atlantic Drift either northward or southward. This modification may be sharp and very noticeable especially during winter months, when the air becomes very unstable with snow or hail showers or even thunderstorms.

Summary

If you have found this chapter on the NAT meteorological environment difficult to assimilate, it is primarily because of the complex and often quick changing nature of the weather over the NAT Region. Keep in mind the following when considering a flight in this environment:

* Canada, Denmark and Iceland require that pilot and aircraft must be IFR rated for trans-oceanic flight, regardless of the altitude to be flown. Other NAT States allow VFR flight at or below FL055.
* However, it is highly unlikely that you will remain VMC on a trans-Atlantic flight. **IT IS THEREFORE STRONGLY RECOMMENDED THAT YOU BE INSTRUMENT RATED AND FILE AND FLY IFR.**

Oceanic Currents and Temperatures

The dominant feature of the North Atlantic is the warm Gulf Stream and its eastward extension, the North Atlantic Drift. As the drift reaches the European sector it branches out. One portion moves northward along the Norwegian coast, known as the Norwegian Current. Another branch flows into the English Channel area. This produces relatively warm sea temperatures along the European shores during the winter months.

A southward flowing branch of the North Atlantic Drift, combined with up-welling, results in a cool current along the west coast of Africa, called the Canaries Current. Cold Arctic water from the Davis Strait reaches the North American coast as far south as New England. This current is referred to as the Labrador Current.

The effect of these currents on the terminal weather around the coastal area of the Atlantic varies with the time of year, the type of air mass involved, and the direction of flow.

Water Temperature Analysis

In conjunction with changeable weather, the water in the North Atlantic is cold. How cold? Take a look at this ....

The following temperatures were taken from the Bunkor Climate Atlas of the North Atlantic and represent average temperatures based on data assembled between 1941 and 1972. All values are in degrees Celsius.

	Frobisher	**Goose Bay**	**Labrador Sea**	**South Greenland**
Jan.	0°	0°	2°	2-4°
Feb.	0°	0°	2°	2-4°
Mar.	0°	0°	2°	2-4°
Apr.	0°	0°	2°	2-4°
May	2°	2°	2°	2-4°
Jun.	2°	4°	2°	2-4°
Jul.	4°	6°	2°	2-4°
Aug.	6°	6-8°	8-10°	6-8°
Sep.	6°	6°	2°	2-4°
Oct.	4°	4°	2°	2-4°
Nov.	2°	2°	2°	2-4°
Dec.	0°	0°	2-4°	2-4°

Survival Chart

Some cold facts on how time and temperature dictates how long you can survive, without an immersion suit, in inhospitable waters:

Water Temperatures		*No Protection*	*Expected Survival*
Deg. C	*Deg. F*	*Exhaustion/Unconsciousness Sets in within*	*Time (with flotation)*
0°	*32.5°*	*under 15 min.*	*under 15 to 45 min.*
0-5	*32.5-40*	*15 to 30 min.*	*30 to 90 min.*
5-10	*40-50*	*30 to 60 min*	*1 to 3 hours*

In simple terms: Your chances of surviving for more than an hour in North Atlantic waters without an immersion suit, are virtually zero.

We now know the weather MIGHT be bad and the water WILL be cold. But wait! There's more...

As you can see from Chart #1, page 2, there are not many places in the North Atlantic to land if you have a problem. You land in Greenland, Iceland, the Faroe Islands, or in the Atlantic Ocean. As illustrated earlier, the ocean is a very poor choice, so let's talk about the other possibilities.

GREENLAND

Seasonal Variation

Within the Sondrestrom FIR, Arctic weather conditions such as intense storms, severe icing, severe turbulence, heavy precipitation, snow and water in various forms may be encountered throughout the year. Weather conditions change rapidly. Due to the mixture of warm air over the oceans and cold air over the icecap, heavy fog may build up over the coasts, closing down all of Greenland's airports simultaneously. Changes will often take place within a few minutes and will not always be included in the forecast received in your briefing prior to departure.

Sea Conditions

The waters around Greenland are not influenced by warmer waters such as the Gulf Stream. They are arctic waters with winter temperatures close to 0° Celsius. During the summer period the water temperatures may rise to 3-6° Celsius at the warmest. This is why you may encounter huge amounts of floating ice in the form of icebergs and ice floes at any time of year.

Terrain

The elevation of the highest point in Greenland is 13,120 ft, (4,006m), and the general elevation of the icecap is about 10,000 ft, (3,053m). The combination of low temperatures and high winds may under certain conditions create a lowest usable flight level of FL235 in the area near the highest terrain, and FL190 over the icecap. On the route between Sondrestrom and Kulusuk the lowest usable flight level in general is about FL130. An equally high flight level can be encountered to and from Narsarsuaq from Canada or Iceland, as crossing the icecap will require a minimum altitude of FL130. On the route from Nuuk/Godthaab towards Iceland either direct or via Kulusuk NDB, the lowest usable flight level will often be FL150. On the direct route via the Prince Christian Sound NDB (OZN) to and from Canada or Iceland, the lowest usable flight level to be expected and planned is FL 110.

Wintertime Darkness/Summertime Daylight

VFR flight at night is not allowed in Greenland. This means you are prevented from flying into Narsarsuaq or Kulusuk VFR at night. VFR flight is only permitted from the beginning of the morning civil twilight until the end of civil twilight. Civil twilight ends in the evening when the center of the sun's disc is 6 degrees below the horizon, and begins in the morning when the center of the sun's disc is 6 degrees below the horizon. Additional information may be acquired from the airport of your destination or your flight planned alternate.

ICELAND

Seasonal Variation

The climate in Iceland is largely influenced by both warm and polar air currents, as well as ocean currents. The mean January (the coldest month) temperature is about 2°C to 0°C (28°F to 32°F). The mean July (the warmest month) temperature is 9°C to F 11°C (48°F to 52°F).

Do not be misled, however, into expecting balmy temperatures and unlimited visibility. Extreme seasonal variations are to be anticipated. Like the majority of the North Atlantic, rapidly changing weather conditions involving severe icing, severe turbulence, and heavy precipitation are common, particularly during the wintertime. Again, these rapid changes make accurate forecasts extremely difficult.

Sea Conditions

Iceland is located near the border between warm and cold ocean currents. The North Atlantic Drift passes just to the south on its course northeastwards, and one of its branches, the Irminger Current encircles the south, west and partly the north coasts. On the other hand, a branch of the cold East Greenland Current, known as the East Iceland Current, flows in a southerly and south-easterly direction along the east coast. The sea surface temperatures are highest off the south and southwest coasts, 7°C to 8°C in winter, but 8°C to 12°C in summer.

Terrain

Iceland is a mountainous country with an average elevation of about 1,650 ft. The highest peak is 6,952 ft. (2119 m.) located near the southernmost edge of the island's largest glaciers. Due to the extreme variances in barometric pressure, coupled with high winds, the lowest usable flight level may be FL120.

Wintertime Darkness/Summertime Daylight

The shortest period of daylight falls in December. A typical day includes approximately 4 hours of daylight with long twilight periods. Like Greenland, VFR flight is not allowed at night. During summer nights, the sun remains 6° or more above the horizon, thus experiencing continuous daylight from 2 May to 25 July.

UNITED KINGDOM

Seasonal Variation

The climate over Scotland and the northern part of the UK is influenced by warm maritime and cold polar air masses, modified by the Gulf Stream current. Seasonal variations are to be anticipated, particularly during the wintertime with severe icing, high winds, severe turbulence and heavy precipitation.

Sea Conditions

The average Mean Sea Surface Temperatures extrapolated for 60N 10W range from 8°C (47°F) in February to 12°C (54°F) in August.

Terrain

The whole of Scotland is designated as a "sparsely populated area". To the west of the mainland are many groups of islands with few airstrips or NAVAIDS. Scotland is mountainous with the highest peak 4,406 ft. The lowest usable flight level may be FL075.

Sea Conditions

The average Mean Sea Surface Temperatures extrapolated for 60N 10W range from 8°C (47°F) in February to 12°C (54°F) in August.

Terrain

The whole of Scotland is designated as a "sparsely populated area". To the west of the mainland are many groups of islands with few airstrips or NAVAIDS. Scotland is mountainous with the highest peak 4,406 ft. The lowest usable flight level may be FL075.

Chapter 3. Equipment

GENERAL

You should have the equipment, documents, and qualifications specified in this chapter for your trans-Atlantic flight. The items listed are required by Transport Canada Aviation Regulations (CAR's) for all flights beginning their trans-Atlantic flights from Canada. Since most eastbound trans-Atlantic flights by light aircraft will commence their oceanic crossing from Canada, this equipment is mandatory. Denmark/Greenland and Iceland also require all the equipment mandated by the CARs. Remember, these Canadian requirements are to ensure that your trans-Atlantic flight ends as planned, not as another "lost in the North Atlantic" statistic. We urge you to comply with all regulations and use common sense!

The next few pages contain reprinted sections of CARs applying specifically to pilot qualifications, required documents, survival and emergency equipment, communication and navigation equipment.

THE CANADIAN AVIATION REGULATION (CARS)

The Legislation

602.39 No pilot-in-command of a single-engine aircraft, or of a multi-engine aircraft that would be unable to maintain flight in the event of the failure of an engine, shall commence a flight that will leave Canadian Domestic Airspace and enter airspace over the high seas unless (the pilot-in-command complies with the following requirements):

Pilot Qualifications

The Pilot-in-Command shall hold a valid pilot license endorsed with a valid instrument rating.

Aircraft Document

a) Certificate of Registration from the State of Registry;

b) Certificate of Airworthiness, Flight Permit, or Special Airworthiness Certificate;

c) Certification and special conditions issued by the State of Registry to allow over gross weight operation if applicable;

d) Certification issued by the State of Registry for fuel tank modification (e.g. FAA Form 337);

e) Revised weight and balance report in the case of aircraft modified to carry extra fuel.

Caution

An Export Certificate of Airworthiness does not constitute authority to operate an aircraft. It must be accompanied by one of the above authorities.

A Temporary Registration Certificate (FAA Pink Slip) is not valid for international operations.

> ***NOTE-***
> *All aircraft entering Canada or transiting through Canada on transoceanic flights, which are operating with restricted Certificates of Airworthiness or Flight Permits, must be issued with Canadian validations of these flight authorities before entering Canada. Canadian validations will be issued upon receipt of a valid or foreign flight authority, and information relating to the dates and routing for the flight. This procedure does not apply to aircraft operating with unrestricted Certificates of Airworthiness.*

Fuel Reserves

An aircraft operated under an IFR flight plan on a transoceanic flight shall carry an amount of fuel that is sufficient to allow the aircraft to fly to and execute an approach and a missed approach at the destination aerodrome, to fly to and land at the alternate aerodrome, and then to fly for a period of forty-five (45) minutes, and in addition, carry contingency fuel equal to at least ten (10) percent of the fuel required to complete the flight to the destination aerodrome.

Aircraft Instruments and Equipment

Aircraft must be approved for IFR flight, and equipped with the following instruments and equipment in serviceable condition.

a) a sensitive pressure altimeter adjustable for barometric pressure;

b) a magnetic compass that operates independently of the aircraft electrical generating system;

c) an airspeed indicator with a means of preventing malfunction due to icing (pilot heat);

d) a turn and slip indicator or turn coordinator;

e) an adequate source of electrical energy, and an adequate supply of fuses, if appropriate;

f) a stabilized magnetic direction indicator or a gyroscopic direction indicator;

g) an attitude indicator;

h) a vertical speed indictor;

i) an outside air temperature gauge;

j) appropriate engine power and performance indicating instruments;

k) a power failure warning device or vacuum indicator that shows the power available to gyroscopic instruments for each power source;

l) fuel tank quantity indicators;

m) an alternative source of static pressure for the altimeter, airspeed indicator and vertical speed indicator; and

n) if the flight is to be made at night;

- a means of illumination for all instruments used to operate the aircraft;
- a means of illumination for all instruments used to operate the aircraft;
- when carrying passengers, a landing light; and
- navigation lights

NOTE-

[1] All equipment and cargo carried in the cabin shall be secured to prevent shafting in flight and placed as to not block or restrict the exits

[2] Consider carrying portable oxygen equipment. It would be useful when trying to avoid icing, and for additional height over the Greenland icecap.

Communications Equipment

Very High Frequency Radio. Sufficient radio communications equipment to permit the pilot, in the event of failure of any item of that equipment, to conduct two-way communications on the appropriate frequency.

High Frequency Radio. An HF radio capable of transmitting and receiving on a minimum of two appropriate international air-ground general purpose frequencies.

NOTE-

[1] The route Iqaluit - Sondre Stromfjord - Keflavik - ALDAN - 61N 10W - Benbecula is approved for non-HF equipped aircraft..

[2] Aircraft may proceed across the Atlantic without HF radio at FL250 or above on the route Goose Bay - Prins Christian Sund (or Narsarsuaq) - Keflavik - ALDAN - 61N 10W - Benbecula. Operations in MNPS airspace (FL 285 to 420) is not allowed unless specific MNPS authority is held.

Navigation Equipment

ICAO Annex 2 requires an aircraft to be equipped with adequate navigation equipment to enable it to navigate in accordance with the flight plan and the air traffic control clearance.

The CARs require that sufficient radio navigation equipment be installed to permit the pilot, in the event of the failure at any stage of the flight of any item of that equipment, including any associated flight instrument display.

a) to proceed to the destination aerodrome or proceed to another aerodrome that is suitable for landing, and

b) where the aircraft is operated in IMC, to complete an instrument approach, and if necessary, conduct a missed approach.

A suitable interpretation of the above would permit an aircraft equipped with VOR/ILS/ADF and a single GPS approved for enroute flight to operate on any of the North Atlantic routes.

Maps and Charts

Each aircraft shall carry CURRENT aeronautical maps, charts, aerodrome data, and IFR approach plates covering the area over which the aircraft might be flown. This includes enroute and departure diversions as well as destination alternates. Whether you plan to file VFR or IFR, there is always the potential for IMC in the NAT Region, therefore, pilots shall carry IFR publications.

Aircraft landing at Narsarsuaq shall carry a topographical chart of large enough scale to permit map-reading up the fjord.

Emergency Equipment Requirements

Aircraft operators shall comply with the requirements of the State of Registry with regard to overwater safety equipment, and overland safety equipment designated for areas in which search and rescue would be especially difficult, for example, Labrador, Greenland, and Iceland.

Overwater Survival Gear

ICAO Annex 6 and the CARs (relating to Canadian registered aircraft) require that the following be carried on single-engine flights over water beyond 100 NM gliding distance from land, or 200 NM in the case of multi-engine aircraft able to maintain flight on one engine:

a) Hypothermia protection (survival suits) for each occupant;

b) Life raft equipped with an attached survival kit, sufficient for the survival on water of each person on board the aircraft, given the geographical area, the season of the year and anticipated seasonal variations, that provides the means for:

1 Providing shelter,
2 Purifying water, and
3 Visually signalling distress

For U.S. registered aircraft, the 14 CFR Part 91 sea survival kit would be appropriate.

Overland Survival Gear

ICAO Standards Annex 6 and the CARs (relating to Canadian registered aircraft) require that the following be carried on flight over or into the interior of Labrador, Greenland, Iceland and Scotland providing the means for:

a) starting a fire;

b) providing shelter;

c) purifying water, and

d) visually signaling distress

It is strongly recommended that transoceanic operations obtain a handbook on survival on the water and in inhospitable areas, and make up an appropriate kit form that book.

Operational Considerations in Sparsely Settled Areas

Experience has shown that there is a tendency for pilots who are not familiar with the problems of navigating and the potential dangers of operating in the sparsely settled areas of Canada, Greenland, Iceland, and Scotland to underestimate the difficulties involved.

Some pilots assume that operating in these areas is no different than operating in the more populated areas. This can lead to a lack of proper planning and preparation which can result in the pilot-in-command exposing himself, his crew, his passengers, and his aircraft to unnecessary risks. This in turn can lead to considerable strain being placed on the limited local resources at stop-over or destination airports. Lengthy and expensive searches have resulted which, with careful planning and preparation, could have been avoided. IN SOME CASES IT HAS RESULTED IN UNNECESSARY LOSS OF LIFE.

The fact is that in sparely settled areas, aircraft operations require special considerations. In this area radio aids to navigation, weather information, fuel supplies, aircraft servicing facilities, accommodations and food are usually limited and often non-existent.

In addition to the regulations concerning pilot qualifications and experience, it is recommended that the pilot have:

a) flight experience with significant cross country, night and actual instrument time;

b) experience in using the same navigational equipment that will be used to cross the Atlantic; and

c) experience in the same type of aircraft that will be used to cross the Atlantic.

Chapter 4. Route Planning

General

Freezing levels at or near the surface can be expected at any time of year over the NAT Region. The dangers of airframe and/or engine icing must always be taken into account, so be prepared to wait for favorable conditions. If you have to fly when there is a threat of icing, keep clear of clouds. Remember, as a general rule, the freezing level should be 3,000 feet AGL or higher to allow for ridding the aircraft of ice, if necessary.

Commonly Flown Routes

The most frequently flown NAT routes from Canada are as follows:

1. Iqaluit, Sondestrom, W28, Kulusuk, 65N/ 30W. Xray, Keflavik, 61N/1234W, Stornoway, Prestwick
2. Iqaluit, Godthaab, W47, Kulusuk, 65N/30W, Xray, Keflavik, 61N/1234W, Stornoway, Prestwick
3. Goose Bay, Loach, 59N50W, SI-Narsarsuaq, 62N/40W, 63N/30W, Uniform, Keflavik, 61N/1234W, Stornoway, Prestwick
4. Goose Bay, Loach, 58N/50W, OZN, 61N/40W, 63N/30W Uniform, Keflavik, 61N/1234W, Stornoway, Prestwick
5. Gander, 5414N/50W, OZN, 61N/40W, 63N/30W, Uniform, Keflavik, 61N/1234W, Stornoway, Prestwick
6. Gander, 50N/50W, 52N/40W, 53N/30W, 53N/20W, 53N/15W, UN530, Shannon
7. St. John's, G/C Flores, Santa Maria

Chapter 5. Flight Planning

General

It is extremely unlikely that you will be able to conduct a flight across the Atlantic and remain in visual meteorological conditions (VMC) for the entire flight. Go back and **READ THE UNDERLINED SENTENCE AGAIN!** VFR flight in this airspace deprives the pilot of the flexibility of using the altitudes above FL055. The higher altitudes may enable a smoother flight, free of precipitation, icing or turbulence.

Flights operating in the NAT Region need to file an ICAO flight plan if operating at FL 060 or above or, if VFR, the flight intends to cross an international border. Detailed instructions for completion of the ICAO flight plan are found in the ICAO Document 4444, Appendix 2; the AIP Canada RAC 3; and similar publications printed by other States. An example of a completed ICAO Flight Plan can be found in this chapter.

Prospective transoceanic fliers familiar with FAA flight plan formats should carefully review the ICAO flight plan instructions as they are quite different from domestic U.S. flight plan formats. International flight service stations can provide assistance in filing an ICAO flight plan.

Generally all eastbound or westbound aircraft in the NAT Region must flight plan so that specified tenth degrees of longitude (60°W, 50°W, 40°W, 30°W, etc.) as applicable, are crossed at whole degrees of latitude. Generally northbound or southbound aircraft must flight plan so that specified parallels of latitude spaced at five degree intervals (65°N,60°N,55°N,50°N, etc.) are crossed at whole degrees of longitude.

Pre-Flight Planning

Plan your flight using current aeronautical charts, the latest edition of pertinent flight supplements, NOTAMs, and particularly International NOTAMs. Familiarize yourself with the nature of the terrain over which the flight is to be conducted. If you are not familiar with the area, consult the aviation authority officials at appropriate local aviation field offices before departure. These officials, as well as local pilots and operators, can provide a great deal of useful advice, especially on the ever-changing supply situation, the location and condition of possible emergency landing strips, potential hazards, and en route weather conditions. Pre-flight planning must ensure the availability of fuel, food, and services you may require at intermediate stops and at your destination.

The majority of military activity takes place in the NAT below MNPSA. Military exercise particulars will be published in a NOTAM/International NOTAM, and should be reviewed during your pre-flight briefing.

Planning your trans-Atlantic flight for the summertime will allow you to take advantage of the most favorable conditions. Not only are the ground (and water) temperatures less menacing, but also the amount of available daylight is considerably greater.

Depth perception is poor at night. North of 60 North Latitude, which includes the most common trans-Atlantic routes flown by general aviation aircraft, there are only about 4 hours of daylight during December. To this is added an additional complication: VFR flights at night are prohibited in Iceland and Greenland. When you combine all this with the increased possibility of storms during the winter you will understand why we recommend that you plan to make your trans-Atlantic flight during the summer months.

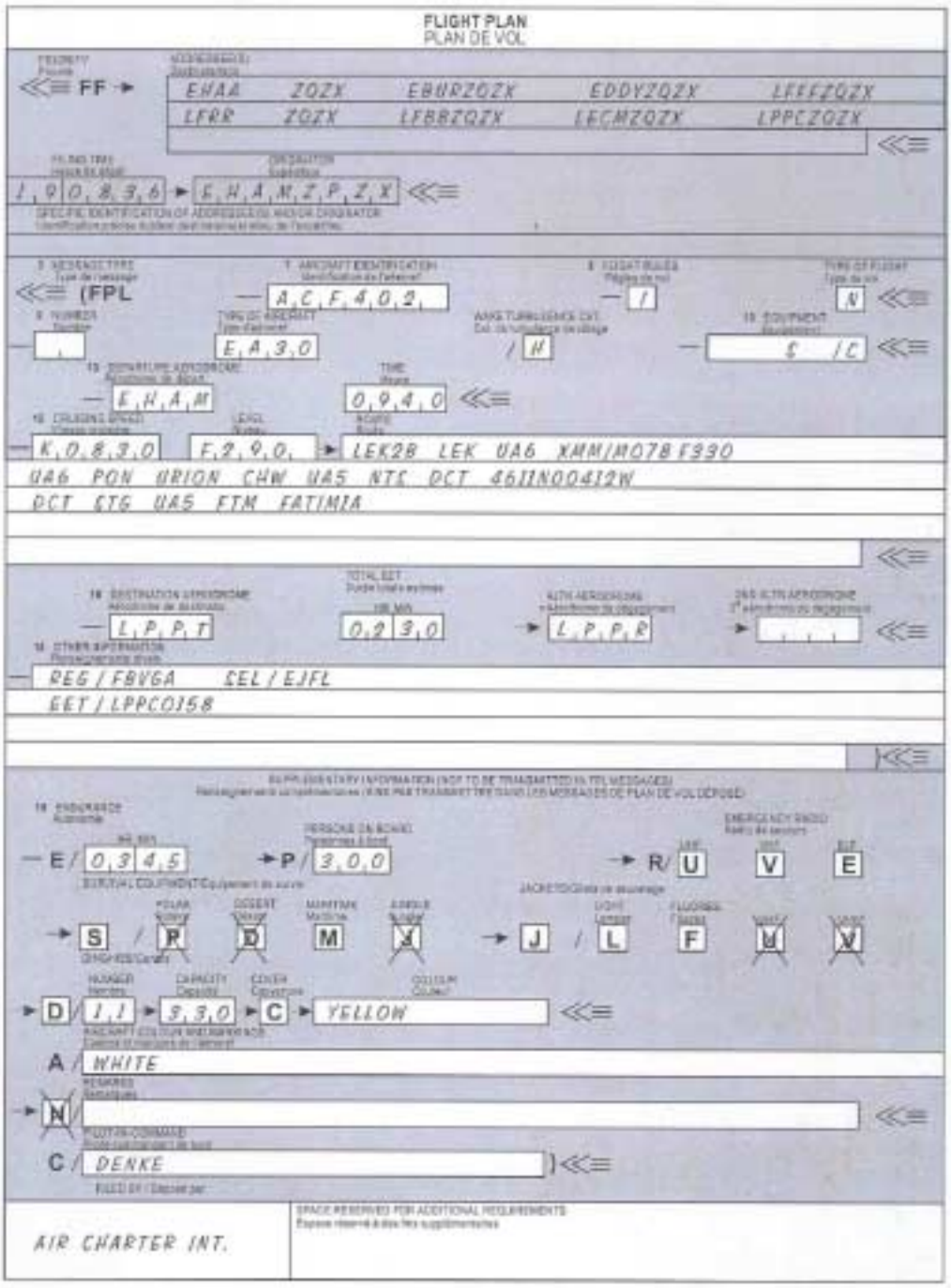
Carriage of Arms

A rifle may be carried subject to a valid permit being issued from the appropriate Canadian provincial and territorial authorities to have such weapons aboard. Under NO circumstances will permission be granted for the carriage of small arms or automatic weapons.

Physiological Factors

Crossing the North Atlantic in a general aviation aircraft is a long and physically demanding task. You will want to make some provisions to eat, drink, and take care of all necessary bodily functions (we don't know of any delicate way to discuss this). Desperately needing a restroom, WC, toilet facilities, or whatever you choose to call them has been the foundation for countless comedy routines. But if you suddenly discover you failed to plan for this inevitable need, it won't be funny at the time (although it may be later).

Oceanic Flight Plan Example



Chapter 6. Clearances

General

All flights planned at or above FL060 in oceanic CTAs are required to obtain an IFR clearance prior to leaving the CTA floor, which generally starts at FL055. Additionally, all operations in the Sondrestrom and Reykjavik FIRs above FL195 must be on IFR flight plans. It is important to note that the airspace over Southern Greenland (South of 63°30'N) above FL195 is controlled by Gander OAC. Therefore, clearance is required from Gander OAC prior to descent into the Sondestrom FIR below FL195 in this airspace. Clearance can be obtained through Gander IFSS, or if unable, through Sondestrom.

When operating on an IFR clearance, any change of altitude or true airspeed greater than 5 percent requires re-clearance from ATC. Clearances for VMC climb or descent will not be granted.

Pilots are required to obtain a clearance from the ATS unit responsible for their area of operation and to follow the procedures specified in appropriate AIPs. Where possible, clearance to enter controlled airspace should be obtained prior to take-off, as communication problems are often encountered at low altitudes.

Obtaining a Clearance

Canada--

Oceanic clearances for eastbound IGA NAT flights, departing from Eastern Canada, are obtained from the control tower or the flight service station at the aerodrome of departure prior to departure. Eastbound IGA NAT over-flights obtain their oceanic clearance directly from Gander ACC, Moncton ACC, or Montreal ACC, or through a flight service station, depending on the route of flight.

United Kingdom/Ireland--

At some airports situated close to oceanic boundaries, the oceanic clearance can be obtained before departure e.g. Prestwick, Shannon, Glasgow, Dublin. Westbound aircraft operating within the UK FIR should request oceanic clearance from Shanwick Oceanic on VHF at least 30 minutes before point of entry. Aircraft unable to get clearance on VHF should request clearance on NARTEL HF (North Atlantic Enroute HF RTL Network). Aircraft unable to contact Shanwick, as detailed above, should request the ATC authority for the airspace in which they are operating to relay their request for oceanic clearance to Shanwick. Flights planned to enter the Reykjavik OCA from the Scottish FIR east of 10°W, should request oceanic clearance from the appropriate Scottish domestic sector.

United States--

Prior to entering oceanic airspace you must receive a specific oceanic clearance, detailing the oceanic entry point, route, landfall (or oceanic exit point), and airways to destination. This clearance will be issued by the ATC unit responsible for providing air traffic service in the airspace abutting the oceanic area. If you do not receive an oceanic clearance approaching the oceanic entry fix, **REQUEST ONE.**

Chapter 7. Navigation

General

Navigation in the North Atlantic, or in any oceanic area for that matter, is considerably more difficult than over land. There are no landmarks, and short range navigational aids (VOR/NDB) are few and far between. Your aircraft should be equipped with some type of Long Range Navigation (LRNS) equipment for your flight. Loran C, a popular type of area navigation in many parts of the world, is **NOT** reliable in all areas of the North Atlantic because of poor ground wave signal coverage in some areas. This statement contradicts some maps depicting Loran C ground wave coverage, but experience demonstrates that you should **NOT** use Loran C as your sole means of area navigation in the North Atlantic, except in certain areas. For these reasons and due to the decommissioning of Loran C stations in the region, we cannot publish Loran C coverage charts for the NAT. The United States, Canada and also Greenland (Denmark) have approved GPS for use in the Ocean under certain conditions (see Chapter 3, Navigation Equipment).

The use of a self-contained navigation system INS/IRS is recommended.

On the Northern routes it is important to note the pronounced magnetic variation--up to approximately 40 to 45 degrees - and the "pull" this variation has on your compass. When performing turns or accelerations, this "pull', termed the "dip effect", causes your compass to turn slower than you are used to in the lower latitudes.

Even with a sophisticated navigation system such as GPS, it is still essential to maintain good navigation practices. Do not just blindly follow the numbers; awareness of the azimuth of the sun, cross-checking with other NAVAIDs and disposition of contrails from high level traffic are all obvious but many errors have occurred which could have been prevented had the pilot shown more awareness.

Route Concerns

There are a few VOR/NDB routes in the North Atlantic. These routes are sometimes known as "Blue Spruce" routes and are depicted on navigation charts from Jeppesen and other sources (see Chart # 1). Other than the Blue Spruce routes, there is little NAVAID coverage at the low altitudes in the NAT. The chart in this manual depicting radio coverage is calculated based on theoretical coverage; actual coverage may be considerably less than that shown, and these charts should by no means be used for navigational purposes.

Chapter 8. Communication

General

As mentioned earlier, VHF radio coverage is very limited in the NAT. Charts 2 and 3, (pages 22 and 23), depict theoretical VHF coverage at FL100 and FL200. Since the coverage is so limited, IT IS REQUIRED THAT YOU HAVE AN HF TRANSCEIVER ON YOUR AIRCRAFT. Radio equipment should be tested prior to departure. For VHF equipment this is best done by calling the tower or ACC on the proper frequency for a ground radio check. HF equipment shall be tested by calling the nearest Aeronautical Radio or Flight Service Station for a ground radio check. If a contact cannot be made on the initial test frequency, try others. If no contact can be made, have your equipment checked. Do not leave the ground until everything is working satisfactorily.

Pilots should be aware that on most occasions when they communicate with Oceanic Air Traffic Control Centers on HF and, on rare occasions VHF, they do not talk directly to controllers. Radio Communicator staff, i.e., Aeronautical Radio Inc. (ARINC) or an international flight service station (IFSS), relay incoming messages and may not always be co-located with an ACC. For example, Shanwick Radio is in the Republic of Ireland while Shanwick Control is based at Prestwick, Scotland. Also, it is important to mention that controller workload on low level IGA flights is usually high, so expect a short delay to your request for a change of flight level, route, etc.

An HF SELCAL device will ease the strain of a continuous listening watch on the designated HF R/T Frequency, Ensure the SELCAL code selected in the aircraft is valid for the Fight Information Region(s) in which you plan to fly.

Remember, if you operate above FL060 you must operate under IFR procedures and therefore you must maintain a continuous listening watch with ATC. IF NOT IN VHF COVERAGE, IT IS YOUR RESPONSIBILITY TO HAVE A SERVICEABLE HF.

Contingencies

Although HF coverage exists throughout the NAT, there are a few associated problems. Depending on atmospheric conditions, it can be relatively noisy with the signal fading in and out. Sometimes several attempts are required to successfully transmit or receive a single message. Additionally, sunspot activity can completely disrupt HF communications for considerable periods of time, varying from a few minutes to several hours. Notices are published whenever disruptive sunspot activity is expected. You may be able to relay VHF or UHF communications through other aircraft operating in the NAT. 123.45 MHz should be used for air-to-air communications. Do not plan to use other aircraft as your primary means of communication. There is no guarantee there will be another aircraft within range when you need it. Consider this an emergency procedure and plan accordingly.

VHF radios for North Atlantic crossings shall include 121.5 MHz capability. A listening watch should be maintained on this frequency unless communications on another frequency prevents it. 121.5 MHz is not authorized for routine use.

NOTE- *All civilian and military aircraft flying in the Elk area, as shown in Chart 4, should maintain listening watch on 121.5 MHz or 126.7 MHz.*

Position Reporting

Unless otherwise authorized by ATC, predominantly North/South NAT flights shall make position reports on the appropriate frequencies at each significant point listed in the flight plan. Eastbound and westbound flights are required to report at every 10 degrees of longitude. Position reports are to be forwarded to air traffic control at least at approximately hourly intervals. However, in the event of low ground speed a position report may be required every 5 degrees of longitude.

Where the position relates to geographical coordinates, the contents of the position report shall be expressed by the latitude and longitude. For generally eastbound or westbound aircraft, latitude is to be expressed in degrees and minutes, longitude in degrees only. For generally northbound or southbound aircraft, latitude is to be expressed in degrees only, longitude in degrees and minutes.

The pilot is required to identify the subsequent position to report as the significant point at which the aircraft is next required to report its position. The next succeeding reporting point along the route of flight is also to be included. If the estimated time over the next significant point is found to be in error by 3 minutes or more, a revised estimated time shall be transmitted to the appropriate ATC unit as soon as possible.

When making position reports all times are to be expressed in UTC, giving both the hour and minutes. A position report example follows: POSITION--N1234D 53 NORTH 25 WEST 1237, FLIGHT LEVEL 090, ESTIMATE 53 NORTH 20 WEST 1356, NEXT 53 NORTH 15 WEST"

The relevant AIPs contain detailed information concerning communication while operating in the NAT.

Common Procedures for Radio Communications Failure

The following procedures are intended to provide general guidance for NAT aircraft experiencing a communications failure. These procedures/regulations are intended to complement and not supersede State procedures/regulations. It is not possible to provide guidance for all situations associated with communications failure.

General

If so equipped, the pilot of an aircraft experiencing a two-way radio communications failure shall operate the secondary radar transponder identity Mode A, Code 7600, and Mode C.

The pilot shall also attempt to contact any ATC facility or another aircraft and inform them of the difficulty and request they relay information to the ATC facility with communications are intended.

Communications failure prior to entering NAT oceanic airspace

If operating with a received and acknowledged oceanic clearance, the pilot shall enter oceanic airspace at the cleared oceanic entry point, level and speed and proceed in accordance with the received and acknowledged oceanic clearance. Any level or speed changes required to comply with the oceanic clearance shall be completed within the vicinity of the oceanic entry point.

If operating without a received and acknowledged oceanic clearance, the pilot shall enter oceanic airspace at the first oceanic entry point, level and speed, as contained in the filed flight plan and proceed via the filed flight plan route to landfall. That first oceanic level and speed shall be maintained to landfall.

Communications failure prior to exiting NAT oceanic airspace

Cleared on flight plan route

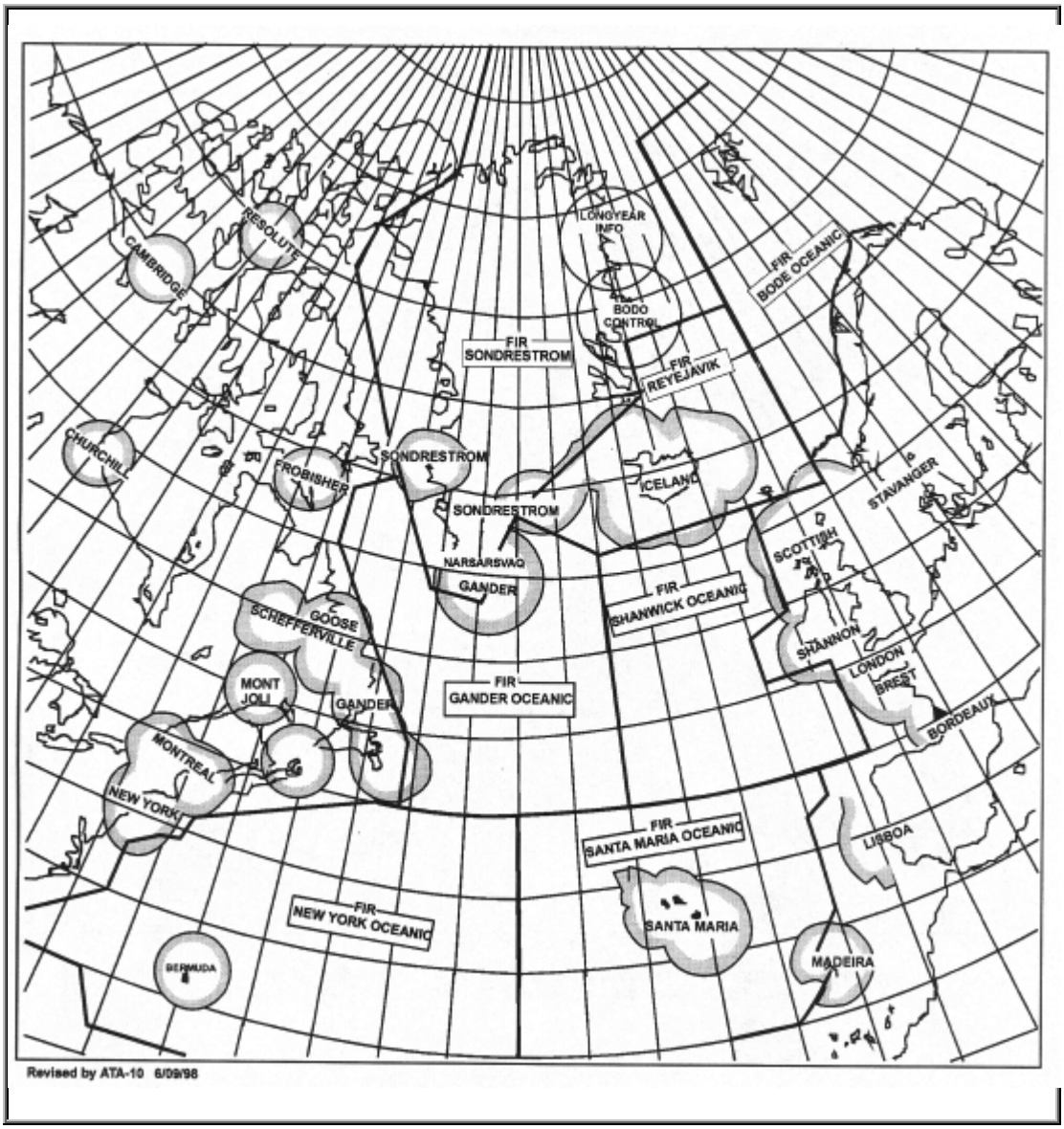
The pilot shall proceed in accordance with the last received and acknowledged oceanic clearance to the last specified oceanic route point, normally landfall, then continue on the flight plan route. Maintain the last assigned oceanic level and speed to landfall. After passing the last specified oceanic route point, conform with the relevant State procedures/regulations.

Cleared on other than flight plan route

The pilot shall proceed in accordance with the last received and acknowledged oceanic clearance, normally landfall. After passing this point, rejoin the filed flight plan route by proceeding directly to the next significant point ahead of the track of the aircraft as contained in the filed flight plan. Where possible use published ATS route structures, then continue on the flight plan route. Maintain the last assigned oceanic level and speed to the last specified oceanic route point. After passing this point conform with the relevant State procedures/regulations.

Chart #2

VHF RADIO COVERAGE IN THE NAT REGION AT FL100



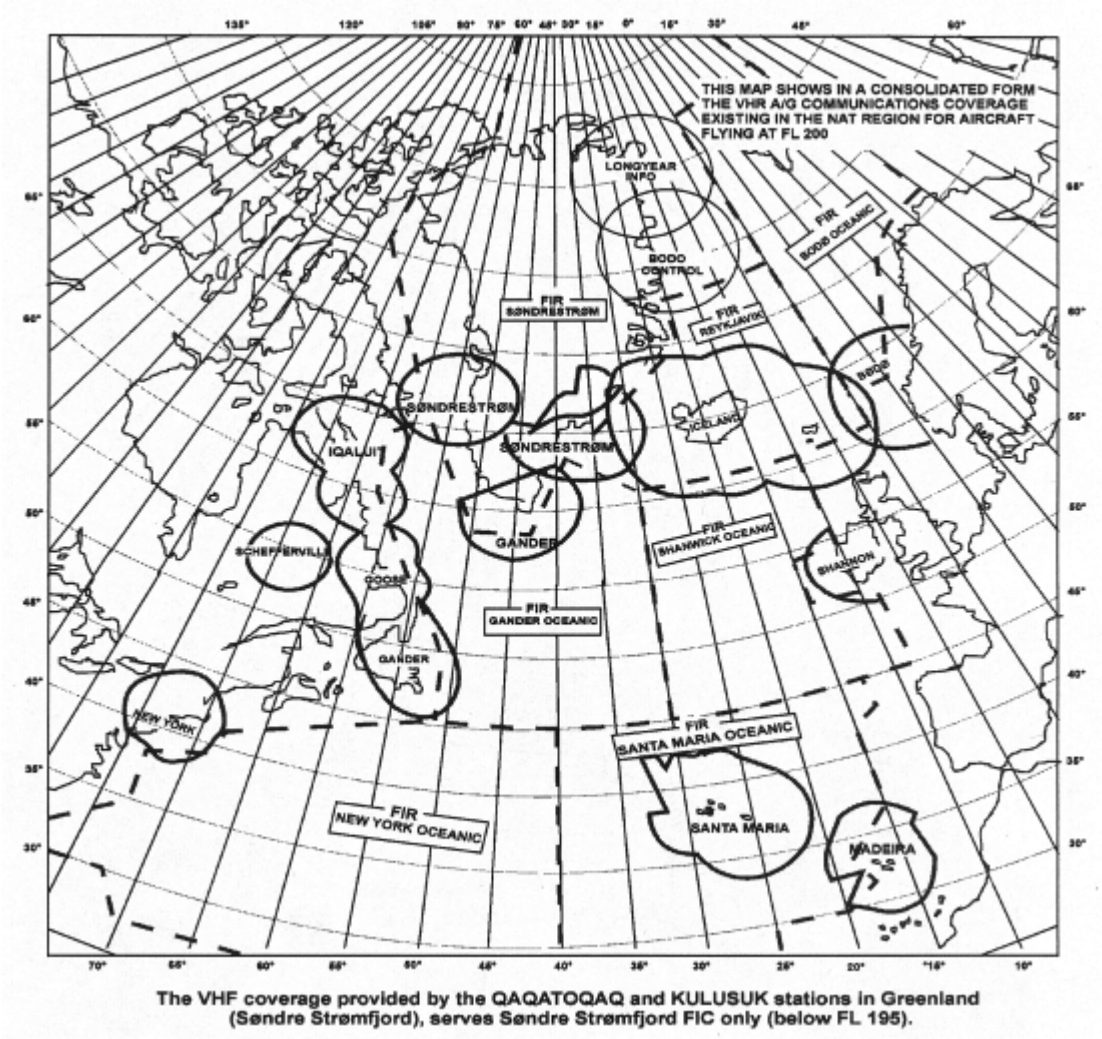
NOTE-

[1] The VHF cover depicted in the transition area between the NAT and the EUR Regions has only been shown to complete the picture of the communications cover. The VHF air/ground communication stations at Stavanger, Scottish, London, Brest, Bordeaux, and Lisboa do not form part of the communication system serving the NAT Region.

[2] The VHF cover provided by the Oaqatoqaq and Kulusuk stations in Greenland (Sondrestrom) serves Sondrestrom FIC only (below FL195)

[3] NARSARSVAQ information serves Sondrestrom FIC only (below FL195).

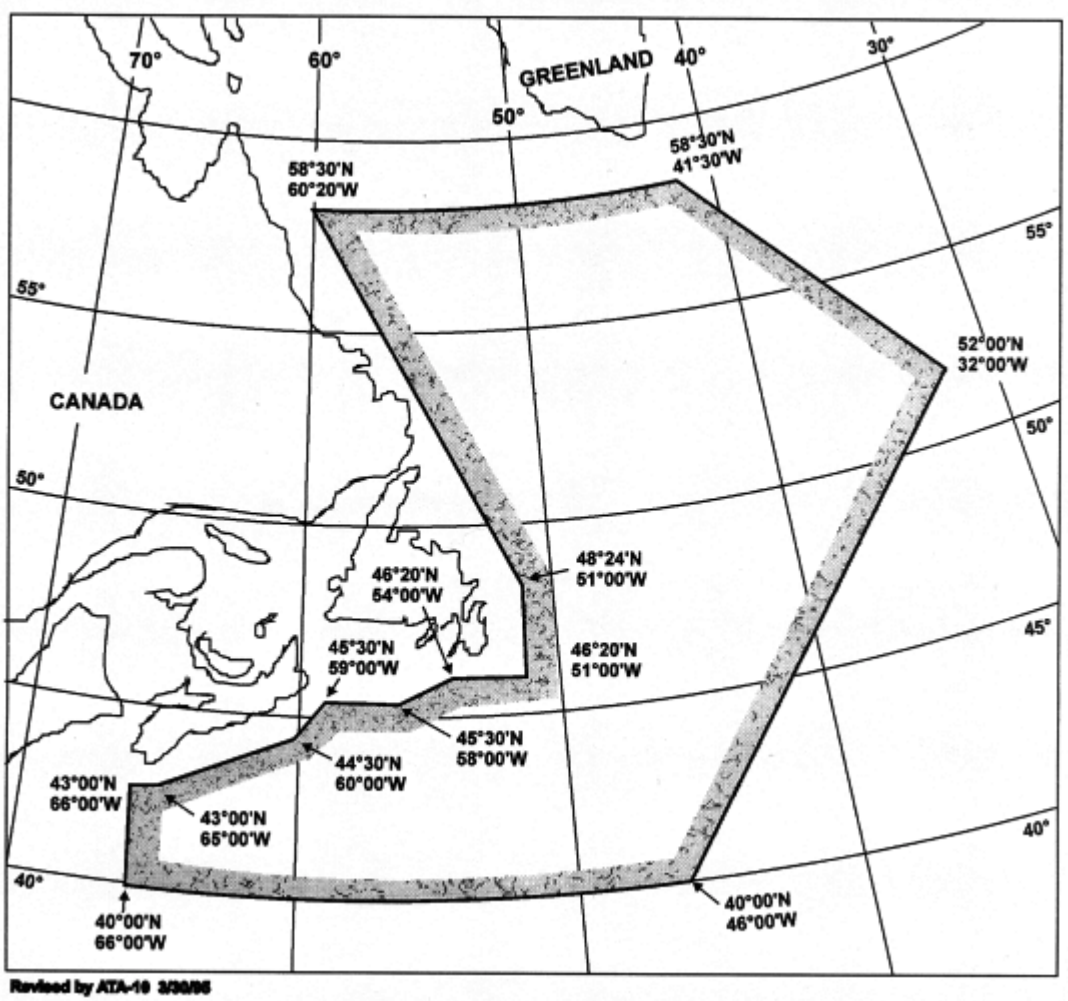
Chart #3
VHF RADIO COVERAGE IN THE NAT REGION AT FL200



***NOTE** 1: The VHF cover depicted in the transition area between the NAT and the EUR Regions has only been shown to complete the picture of the communication cover. The VHF air/ground communication stations at Stavanger, Scottish, London, Brest, Bordeaux, and Lisboa do not form part of the communication system serving the NAT Region.*

***NOTE** 2: The VHF cover provided by the Qaqatoqaq and Kulusuk stations in Greenland (Sondrestrom) serves Sondrestrom FIC only (below FL195).*

Chart #4 - AREA ELK FL 50 AND BELOW



NOTE- MILITARY OPERATIONS AREA - NORTH ATLANTIC

Operational Patrol Area ELK

1. Maritime surveillance aircraft conduct daily all-weather operational flights in Area ELK. These aircraft are required to operate on various headings and altitudes up to and including FL50 and to make rapid climbs and descents without prior warning. Because of operational considerations they operate without navigation or identification lights during the hours of darkness and often without SIF/IFF.

2. The Canadian Maritime COmmand (CANMARCOM) provides advisory information between maritime aircraft and other aircraft in Area ELK based on known air traffic.

3. Standard pressure setting 29.92 inches is used for transit and separation within the entire area.

4. In the interest of flight safety it is essential that CANMARCOM be informed in advance of all flights or proposed flight in or through Area ELK. Aircraft flight level(s), track and approximate times of ELK penetration and exit are required. Military aircraft are encouraged to communicate directly with CANMARCOM. On prior request, frequencies will be assigned on which to report position and obtain ELK clearance. ASW aircraft will be routed clear of all known military and civil traffic.

5. CANMARCOM may be contacted by the following means:

a) Letter to Commander maritime Command, Halifax, N.S., Canada.

b) Message to MOC HALIFAX.

c) Telephone Maritime Operations Centre 902-427-2501, Autovon 447-2502.

d) On request of the pilot when filing flight plans at departure points in North America, aircraft flight plans may be relayed through ATC channels to Moncton ATCC for Maritime Command Operations.

e) In-flight position reports or advisories when not transmitted directly as in paragraph 4 above may be relayed through Gander or Moncton Airways. These messages should specify "Pass to Maritime Operations Centre."

Chapter 9. Surveillance

General

Radar coverage in the NAT Region is limited. As in most oceanic areas, there is a lot of airspace and no place to put a radar site. Nevertheless the importance of an operable transponder cannot be over emphasized.

Some radar sites that do cover portions of the NAT are secondary radar equipped only. Unlike primary radar, secondary radar can only "see" aircraft that have an operating transponder: it cannot "paint" a target based on a radar echo from the aircraft's skin. At this point you may be asking yourself, "If radar coverage is limited, what purpose would an operable Mode C transponder serve?"

It is important to note that many search and rescue (SAR) missions occur within radar coverage. In any emergency situation (lost, out of fuel, engine failure, etc.) your chances of survival are vastly increased if you are radar identified and SAR services can be radar vectored to your position.

Chapter 10. Search & Rescue (SAR)

General

Air traffic services authorities must receive position information on all aircraft within their jurisdiction at least once per hour. If these hourly reports are not received, SAR procedures are initiated.

Pilots should request advisories or assistance at the earliest indication that something may be wrong. Most search and rescue facilities and international air carriers monitor VHF 121.5 continuously. SAR aircraft are generally equipped with homing devices sensitive to VHF 121.5 Mhz. If you are unable to reach any facility, you may attempt contact with other aircraft on 123.45 MHz or 121.5 MHz. Most international carriers are also able to receive Emergency Locator Transmitter (ELTs) in the event manual activation of your ELT is possible. The ELT should be activated and left on continuously. The 406 MHz beacon provides a more accurate position and also identification data, both of which improve SAR response efficiency.

COSPAS-SARSAT, a satellite-based system, can provide a distress alert and means of position determination based on an ELT signal. The 406 MHz ELT is designed specifically with this satellite system in mind. On 121.5 and 243.0 MHz, the satellite system is designed to locate continuous transmissions from beacons. However it will also localize voice transmissions on these frequencies if the transmission lasts from some 4 to 6 minutes and a satellite is in the line of sight of the transmitter. Satellite orbitology is usually available to RCCs so the most effective use of VHF voice transmissions for satellite detection is usually on instruction from an RCC as to when to transmit. However, in extremes, transmit blind and you may be lucky. The position drawn from the satellite may be as much as 20km (12nm) in error and 30 minutes old, but any position is better than none at all. It is a good possibility that Direction Finding (DF) stations will not exist along the major portion of your route of flight.

At many locations throughout the North Atlantic neither search and rescue personnel nor equipment is available on a 24 hour basis. Rescue/recovery from the ocean will likely be by a Maritime craft in the vicinity. The primary SAR asset often will be civilian aircraft chartered from private companies at great expense. These aircraft and their crews are frequently exposed to dangers which could have been avoided simply by better preparation on the part of IGA pilots. The general reasons for the alerts, the searches, and the fatalities, are most often poor planning, poor navigation, insufficient fuel, and the lack of knowledge of flying in the NAT Region.

It is important to note that some States may hold an individual accountable for the costs of SAR actions should a pilot be found to be in breach of current regulations.

Should worse come to worse and you have to put down in the North Atlantic, do you fully appreciate the predicament that you would be in? All your pre-flight planning, your inspection at Moncton, all the equipment you carry, is of little use if you cannot survive long enough to allow SAR forces to recover you reasonably intact. If you remember nothing else, remember the first two principles of survival--PROTECTION and LOCATION. In the NAT Region at anytime of year, the weather is your enemy, so wear your protective garments at all times. It is much too late to be climbing into clothing while presiding over an engine that is refusing to cooperate and at the same time trying to contact a friendly 747 to explain that you have a problem.

With excellent satellite coverage of the region, LOCATION is no problem if your ELT works. But who is going to recover you? In general terms, helicopters operate out to a maximum of 300nm from base without air to air refueling and the latter is a very scarce enhancement. Long range SAR aircraft could localize your ELT, but their time on task in the area, on low level visual search, should that be necessary, is only in the order of 2 to 3 hours. It is fairly obvious that a 24 hour search would take 8 aircraft and a visual search for a single seat life raft, even with a comparatively good datum, is a needle-in-a-haystack problem. So guard your ELT with your life; It could be your only salvation. Oceanic Air Traffic Control Centers will contact rescue coordination centers to find out what assistance can be provided by other craft in the area. This would often include ships or boats. Of particular help are merchant vessels contacted by means of the ship reporting system called AMVER. The section on aircraft ditching provides more insights.

Hypothermia

Causes

Hypothermia can develop quickly and kill you. Sometimes referred to as exposure sickness, it is a condition of the body when its inner-core temperature falls to a level at which the vital organs no longer function effectively.

Hypothermia is caused by cold, wetness, and/or wind chilling the body so that it loses heat faster than it can produce it. Frequently the advent of hypothermia is hastened by a deficiency of energy producing food in the body. However, the greatest single contributing factor to hypothermia is improper clothing.

Hypothermia can occur anywhere that the environmental temperature is low enough to reduce the body temperature to a dangerous level. It occurs most frequently at sea or in rugged mountain terrain where a person on foot can pass from a calm and sunny valley to a wind and rain-lashed mountain ridge in a few hours. Most hypothermia accidents occur in outdoor temperatures between 1° and 10° C (30° to 50°F).

Symptoms

Fortunately the approach of hypothermia is easily noticeable and its advance marked by recognizable steps or stages. If the warning signs are heeded and counter-measures taken, tragedy can be avoided.

Noticeable symptoms normally occur in the following stages:

1. A person feels cold and has to exercise to warm up.
2. He starts to shiver and feel numb.
3. Shivering becomes more intense and uncontrollable.
4. Shivering becomes violent. There is a difficulty in speaking. Thinking becomes sluggish and the mind begins to wander.
5. Shivering decreases and muscles begin to stiffen. Coordination becomes difficult and movements are erratic and jerky. Exposed skin may become blue or puffy. Thinking becomes fuzzy. Appreciation of the seriousness of the situation is vague or nonexistent. However, the victim may still be able to maintain the appearance of knowing where he is and what is going on.
6. The victim becomes irrational, loses contact with the environment, and drifts into a stupor.
7. Victim does not respond to the spoken word. Falls into unconsciousness. Most reflexes cease to function and breathing becomes erratic.
8. Heart and lung centers of the brain stop functioning. The individual is now a fatality.

Note: Although the above symptoms are those typically noted, one of the editors of this manual has experienced hypothermia and he recalls that his symptoms were NOT easily noticeable. In fact, he was not aware at all that he was slipping into hypothermia. His symptoms were observed by a climbing partner who took appropriate action.

Treatment

A person who is alert and aware of the potential dangers can help himself in stages 1 through 3. But once the condition has advanced to stage 4 and the person's mind begins to wander, he may not realize what is happening and may well need assistance. Further deterioration will definitely require outside aid. Anyone showing any of the above-mentioned symptoms, including the inability to get up after a rest, is in trouble and needs your help. He may not realize and deny there is a problem. Believe the symptoms, not the victim. Even mild symptoms demand immediate and positive treatment.

1. Get the victim out of the cold, wind, and rain.
2. Strip off all wet clothes.
3. If the person is only mildly impaired;
  (a) give him warm, non-alcoholic, drinks.
  (b) get him into dry clothes and a warm sleeping bag;
4. If the victim is semi-conscious or worse;
  (a) try to keep him awake and give him warm drinks.
  (b) leave him stripped: put him in a sleeping bag with another person (also stripped); skin to skin contact is the most effective treatment.
5. If he has recovered sufficiently to eat, feed him. Make sure he is dressed in warm clothing and well rested before starting on again.
6. If the victim has to be carried out, make sure his body temperature has been brought up to normal and wrap him in a good sleeping bag before starting out.

Prevention

With the exception of cases involving bodily injury, most hypothermia accidents may be prevented. The first thing to remember is that hypothermia can occur anywhere and at any time that the air temperature drops low enough so that if a body is exposed, its inner-core temperature can be reduced to the danger level.

Remember, wind chills the air.

Wet clothing in cold weather extracts heat from the body nearly 200 times faster than dry clothing. Wool clothing provides better protection than cotton in wet weather. In inclement weather, an uncovered head can account for up to 60% of body heat loss. A good wool cap is essential. The most common contributors of the development of problems during cold, wet, and windy weather are lack of proper clothing, inadequate shelter, and exhaustion. The best defense against the advent of hypothermia is to avoid exposure by being prepared .

1. Dress appropriately.
2. Carry rainwear, extra dry clothes, food, and matches.
3. Bring potential dangers to the attention of anyone inappropriately dressed. It could save his life.
4. Make the basic rules of conduct for trail safety clear, and that you expect them to be observed.
5. Travel at the speed of the slowest member of your party.
6. Break frequently for rest and gear check.
7. Distribute candies or other nibble food.
8. Keep watching all members of your party for signs of fatigue or discomfort.

Chapter 11. Checklist

General

A thorough pilot will make every attempt to avoid in-flight problems prior to departure. While each aircraft will require a different specific inspection, in this section we have provided a general checklist for pre-flight preparation, inspection and in-flight contingencies.

Be prepared for systems failure. Know what to do in advance. Always plan a way out of a situation. If a borderline decision has to be made, take the safest course of action. Don't exceed your own or the aircraft's limitations. Face the fact that you are flying with what can only be called minimum equipment. If anything, including weather, equipment, or your health, is not up to par, DON'T GO.

Position survival gear so that it is readily available, but clear of controls. The best survival techniques include thorough planning, knowledge of the route, and reliable weather information. There is no room for error in trans-oceanic flight, so plan accordingly, then re-check.

Allow sufficient time for a thorough briefing, planning, and administrative details. Try to put the airplane to bed ready to go, avoiding the possibility of last minute mistakes.

Pre-Flight Preparation

The following checklist, cross-referenced to text appearing in this manual, will assist you during the preparation stages of your oceanic flight. It is not intended that this checklist address all aspects of oceanic flight preparation.

- Have you obtained all the current departure, enroute arrival and topographical charts for your entire route of flight and your alternate? (Chapter 3)
- Do you have an instrument rating and have you recently flown IFR? (Chapter 3)
- What long range NAVAIDS are you planning to use? When did you last practice long range navigation? (Chapter 3)
- What can you expect in terms of available daylight in Iceland, Greenland? (Chapter 3)
- Has your aircraft been thoroughly inspected by a licensed mechanic for suitability for a long, over water crossing? Do you have the necessary aircraft documents? (Chapter 3)
- If your flight will transit Canadian airspace, and chances are good that it will, do you have the required Sea/Polar Survival equipment necessary to adhere to Canadian Air Regulation 540? (Chapter 3)
- What is the proper format to be used when filing an oceanic flight plan? (Chapter 5)
- Are you aware of the proper procedures to be used in obtaining an oceanic clearance? (Chapter 6)
- What do you know of hypothermia? How can it be prevented? (Chapter 10)

- What can you expect in terms of VHF radio coverage in the NAT Region? (Chapter 8)
- Do you know what to include in a position report? When should a revised estimate be forwarded to ATC? (Chapter 8)
- Is the selected SELCAL Code valid for the FIRs in which you are planning to fly? (Chapter 8)
- If the flight is planned for FL285 or above, has the State of Registry approved the flight in MNPS Airspace through a letter of authorization or its equivalent? (Foreword, Chapter 1)
- Are you fully briefed on what to expect in the way of Search and Rescue services? Do you understand the importance of an operable ELT? (Chapter 10)
- Have you obtained the relevant meteorological information for your flight? (Chapter 2)
- Have you checked current NOTAMs with special regard to the status of radionavigation aids and airport restrictions? (Chapter 5)

Pre-Flight Inspection

Pull the cowling and inspect for leaks and general overall condition. Inspect:

1. Fuel system and management
2. Radio equipment and condition
3. Engine condition
4. Oil pressure, temperature, and consumption
5. Instruments

Check compass on nearest runway heading to your course (on a compass rose if available within 30 days prior to departure).

1. Swing compass with radios and navigation lights ON
2. Check compass deviation with master switch off
3. Check compass deviation with VHF off
4. Check compass deviation with HF both ON and OFF
5. Check compass deviation with pilot heat ON
6. Check compass deviation with rotating beacon ON and OFF
7. Make notes on all deviations
8. Keep alternator load at 50% or less if possible
9. DO NOT assume compass card is accurate ADF may be affected by the alternator, VHF, HF, pilot he at, rotating beacon, autopilot, coastal refraction, or atmospheric conditions. Check and re-check all NAVAIDs receivers.

In-Flight Contingencies

Do not deviate from your current flight plan unless you have requested and obtained approval from the appropriate air traffic control unit, or unless an emergency situation arises which necessitates immediate action. After such emergency authority is exercised, the appropriate air traffic services unit must be notified of the action taken and that the action has been taken under emergency authority.

Make all position reports, as detailed on page 20, and report any problems to Air Traffic Control agencies as soon as possible. It is also good policy to report fuel remaining in hours and minutes when relaying position or other relevant flight information.

If you encounter difficulty, report immediately on the appropriate VHF/HF frequency or on VHF 121.5. Don't delay in this call, as it could take SAR forces up to four hours to reach your position.

Remember that commercial airline traffic over the North Atlantic is heavy. Do not hesitate to enlist the assistance of these aircraft in relaying a position or discussing a problem. The VHF frequency 123.45 MHz is for exclusive use as an air-to-air communications channel. The moral support alone may be enough to settle nerves and return the thought processes to normal.

The weather at your destination should be well above IFR minimums and forecast to remain so or improve. After 10 to 14 hours at altitude, your ability to handle marginal weather conditions may be in serious doubt. Therefore, your personal weather minimums should be well above the published minimums. Alternate airports should be chosen with the same care.

ANNEX #1 REFERENCE DOCUMENTATION

The following is a compilation of the principal source documents governing flight operations in international airspace. The source information is organized here in two groups--the first of which is a listing of the applicable documents, the second cross references chapters and paragraphs with specific subject matter.

I. Document Listing

a. *Canadian Documentation*

1. Canada Aeronautical Information Publication (AIP)
2. Canada Flight Supplement (CFS)
3. Enroute High Altitude Charts--HEl and HE4 (NAT)
4. Enroute Low Altitude Charts--LE9 and LE10 (NAT)
5. North Atlantic MNPS Airspace Operations Manual
6. Transport Canada IGA Aircraft Transatlantic Flight Requirements Pamphlet

Canadian Documentation may be obtained through the following agencies:

1. The Canada AIP
Transport Canada
Aeronautical Information Services
Publication and Distribution
Ottawa, Canada
KIA ON8

2. The CFS and Enroute Charts
Canada Map Office
Department of Energy, Mines and Resources
615 Booth Street
Ottawa, Canada
KlA OE9

3. The North Atlantic MNPS Airspace Operations Manual
Transport Canada
Air Traffic Services
Airspace and Procedures
Ottawa, Canada
KIA ON8

4. The Transport Canada IGA Aircraft Transatlantic Flight Requirements Pamphlet
Transport Canada
Aviation Licensing Branch
P.O. Box 42
Moncton, New Brunswick
Canada
ElC 8K6

b. *Denmark (Greenland) – The Greenland AIP may be obtained by writing to:*

Civil Aviation Administration
Box 744
Luftfartshuset (Ellebjergvej 50)
DK 2450
Copenhagen SV, Denmark
Telex: 27096 CAADK
Tel: 45 36 44 48 48
Fax: 45 36 44 03 03
E-mail: dcaa@caa.dk

c. *ICAO Documentation*

1. Rules of the Air: Annex 2
2. Operation of Aircraft: Annex 6
3. Telecommunications: Annex 10
4. Air Traffic Services: Annex 11
5. Search and Rescue: Annex 12
6. Procedures for Air Navigation Services--Rules of the Air and Air Traffic Services: (Doc 4444/501)
7. Regional Supplementary Procedures: Doc 7030
8. Aircraft Operations: Doc 8168/OPS

ICAO Documentation may be obtained by writing to:

International Civil Aviation Organization
ATTN.: Document Sales Unit
1000 Sherbrooke Street West, Suite 400
Montreal, Quebec
Canada H3A 2R2
Phone: 514-285-8219
Fax: 514-288-4772

d. *Iceland - Documentation may be obtained by contacting:*

Civil Aviation Administration
Aeronautical Information Service
Reykjavik Airport, Iceland
Tel 354-1-694100
Fax: 354-1-624599
Telex: 2250 FALCON IS

e. *UK Documentation*

1. NAT Briefing Information
2. United Kingdom Aeronautical Information Publication (AIP)
3. Notices to Airmen (NOTAMs)
4. Aeronautical Information Circulars
5. North Atlantic MNPS Operations Manual

UK. Documentation is available through the following agencies:

1. For the NAT Briefing Information
UK CAA/NATS Foreign Briefing Services
Control Tower Bldg.
London Heathrow Arpt.
Hounslow
Middlesex TW6 1~J
England
Tel: (+44) 181-745-3441
Fax: (+44) 181-745-3453

2. For the AIP, NOTAMs, Aeronautical Information Circulars, and the NAT MNPS Operations Manual
CAA Printing and Publication Office
Greville House
37 Gratton Road
Cheltenham, Glos. GL50 2BN
Tel: (+44) 1242 235151
Fax: (+44) 1242 584139

f. *U.S. Documentation*

1. United States Airman's Information Manual (AIM)
2. United States International Flight Information Manual (IFIM)
3. United States Aeronautical Information Publication (AIP)
4. North Atlantic MNPS Operations Manual
5. North Atlantic International General Aviation Operations Manual U.S. Documentation is available through the following agencies:
6. For the AIM, AIP, International NOTAMs, and IFIM
Superintendent of Documents
Government Printing Office
Washington, D.C. 20402
7. For Supplements and En Route Charts
National Ocean Service (NOS)
NOAA Distribution Branch, N1 CG33
Riverdale, Maryland 20737
8. For the North Atlantic MNPS Operations Manual and North Atlantic International General Aviation Operations Manual
Utilization and Storage Section
M-45.4
U.S. Department of Transportation
400 7th Street S.W.
Washington, D.C. 20590

9. For SELCAL Information

SELCAL Administration
Aeronautical Radio Inc.
Industry Affairs - Frequency Assignment
Attn: Chris Wheatley
2551 Riva Road
Annapolis, MD 21401
Tel: (410) 266-4000

II. Section/Chapter Cross References

a. General

1. General Annex 2, Chapter 2
2. General Rules Annex 2, Chapter 3
3. Air Traffic Services Annex 11
4. General Provisions Doc 4444, Part II
5. Flight Information & Alerting Service Doc 4444, Part VI

b. IFR/VFR Flight Operations

1. Visual Flight Rules Annex 2, Chapter 4
2. Instrument Flight Rules Annex 2. Chapter 5
3. Flight Rules Doc 7030

c. Flight Planning

1. Flight Plans Annex 2, Section 3.3.1
2. Flight Plans and Clearance Doc 7030
3. Model Flight Plan Form Doc 4444, App. 2

d. Navigational Requirements

1. Adherence to Flight Plan Annex 2, Section 3.6.2
2. Aircraft Equipment Annex 2, Section 5.1.1
3. Navigation Equipment Annex 6, Parts I & II Section 2.2
4. Adherence to ATC Approved Routes Doc 7030

e. Communications Requirements

1. Communications Annex 2, Section 3.6.5

BIBLIOGRAPHY

Material contained in this manual was obtained from the following documents and publications:

1. Annexes 2, 6, 10, 11 and 12 to the ICAO Convention;
2. ICAO Document 001, T1 3.5N/5, entitled "Consolidated Guidance Material, North Atlantic Region;
3. ICAO Documents 4444-RAC/501/12 and 7030/4 including Regional Supplements;
4. FAA Handbook 7110. 65, entitled "Air Traffic Control";
5. ICAO publication "North Atlantic MNPS Operations Manual, Ninth Edition;
6. U.S. Advisory Circular 90-92, entitled "Guidelines for the Operational Use of Loran-C Navigation Systems Outside the U.S. National Airspace System (NAS)", 5-2-93;
7. U.S. Advisory Circular 91-70, entitled "Oceanic Operations";
8. Various information furnished by North Atlantic ATS provider States.

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Transport Canada
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Ottawa, Canada
KIA ON8

4. The Transport Canada IGA Aircraft Transatlantic Flight Requirements Pamphlet
Transport Canada
Aviation Licensing Branch
P.O. Box 42
Moncton, New Brunswick
Canada
ElC 8K6

b. Denmark (Greenland) Documentation may be obtained by writing to:
Civil Aviation Administration
Box 744
Luftfartshuset (Ellebjergvej 50)
DK 2450
Copenhagen SV, Denmark
Telex: 27096 CAADK
Tel: 45 36 44 48 48
Fax: 45 36 44 03 03

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ICAO Documentation may be obtained by writing to:
International Civil Aviation Organization
ATTN.: Document Sales Unit
1000 Sherbrooke Street West, Suite 400
Montreal, Quebec
Canada H3A 2R2
Phone: 514-285-8219
Fax: 514-288-4772

d. Iceland Documentation may be obtained by contacting:
Civil Aviation Administration
Aeronautical Information Service
Reykjavik Airport, Iceland
Tel 354-1-694100
Fax: 354-1-624599
Telex: 2250 FALCON IS

e. UK Documentation

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3. Notices to Airmen (NOTAMs)

4. Aeronautical Information Circulars

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London Heathrow Arpt.
Hounslow
Middlesex TW6 1~J
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Fax: (+44) 181-745-3453

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Greville House
37 Gratton Road
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400 7th Street S.W.
Washington, D.C. 20590

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Tel: (410) 266-4000

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- **3**. Air Traffic Services Annex 11
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- **5**. Flight Information & Alerting Service Doc 4444, Part VI

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- **1**. Visual Flight Rules Annex 2, Chapter 4
- **2**. Instrument Flight Rules Annex 2. Chapter 5
- **3**. Flight Rules Doc 7030

cFlight Planning
- **1**. Flight Plans Annex 2, Section 3.3.1
- **2**. Flight Plans and Clearance Doc 7030
- **3**. Model Flight Plan Form Doc 4444, App. 2

d. Navigational Requirements
- **1**. Adherence to Flight Plan Annex 2, Section 3.6.2
- **2**. Aircraft Equipment Annex 2, Section 5.1.1
- **3**. Navigation Equipment Annex 6, Parts I & II Section 2.2
- **4**. Adherence to ATC Approved Routes Doc 7030

e. Communications Requirements
- **1**. Communications Annex 2, Section 3.6.5

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