
DRONESVIP
CIVIL AERONAUTICAL
TRAINING CENTER

AIR NAVIGATION AND INTERPRETATION OF AERONAUTICAL CHARTS

AGENDA

- AIR NAVIGATION CONCEPT
- TYPES OF NAVIGATION
- SATELLITE NAVIGATION
- FLIGHT RULES AND WEATHER CONDITIONS
- BASICS OF ORIENTATION AND LOCATION
- ALTIMETRY AND VERTICAL SEPARATION
- COLLISION AVOIDANCE AND RIGHT-OF-WAY
- TYPES AND CLASSES OF AIRSPACES
- INTERPRETATION OF AERONAUTICAL CHARTS
- VFR CHARTS
- VFR CHARTS INFORMATION
- IFR CHARTS
- IFR CHARTS INFORMATION
- FLIGHT PLANNING
- FLIGHT PLAN
- AERONAUTICAL COMMUNICATIONS

AIR NAVIGATION

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WHAT IS AIR NAVIGATION?

"It can be defined as the set of techniques and procedures that allow an aircraft to be efficiently driven from one geographical place to another, through an established route and monitoring its position along it..."

AUTONOMOUS NAVIGATION

You don't need any external infrastructure or information to successfully complete the flight.

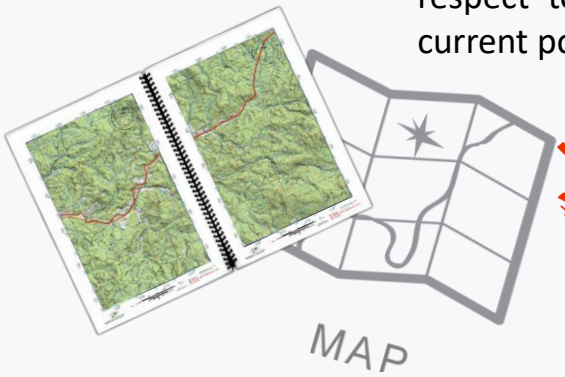
NON-AUTONOMOUS NAVIGATION

It needs external facilities to be able to carry out the flight, since the aircraft is not capable of sailing on its own.

AUTONOMOUS AIR NAVIGATION DIVISION

OBSERVED NAVIGATION: it is based on the direct observation of the necessary references on the earth's surface and recognizing them on the chart by the navigator or pilot.

DEAD RECKONING: The navigator or pilot, calculating the time elapsed flying in a certain direction and the speed with respect to the ground (time and distance), "estimates" the current position and calculates the direction to follow.

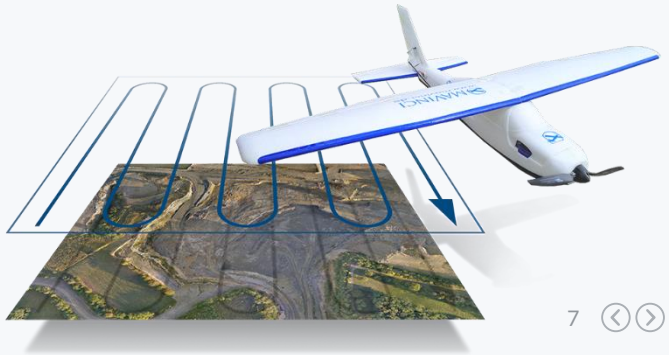


POSITION-FIXING NAVIGATION: It is based on the use of a variety of visual and electronic methods to determine the position of the aircraft, taking into account measurements of distances or angles to reference points, the positions of which are known.

NON-AUTONOMOUS AIR NAVIGATION DIVISION

NAVIGATION BY RADIO AIDS: Also known as "conventional navigation", and can be defined as the set of radio signals, generally generated in ground facilities and received on board, which allow the aircraft to guide itself

SATELLITE NAVIGATION: or GNSS (Global Navigation Satellite System) which basically consists of a constellation of satellites that transmit signals that are used for positioning and location



SATELLITE NAVIGATIONCONSTELLATIONS

NAVSTAR-GPS: (NAVigation System and Ranging – Global Position System), known simply as GPS, operated for the U.S. Government

GLONASS: (Global Navigation Satellite System), operated by the Ministry of Defense of the Russian Federation, which has been used as a backup by some commercial GPS receivers.

GALILEO: which is a global navigation satellite system (GNSS) developed by the European Union (EU), in order to avoid dependence on GPS and GLONASS systems

BEI-DOU

IRNSS

SATELLITE NAVIGATION **WEAKNESSES**

- INTERFERENCE
- ATMOSPHERIC EFFECTS
- GEOMAGNETIC STORMS
- SERVER SUSPENSION

FLIGHT RULES & WEATHER CONDITIONS

VISUAL (VFR): are the different rules necessary to be able to fly safely using only visual observation.

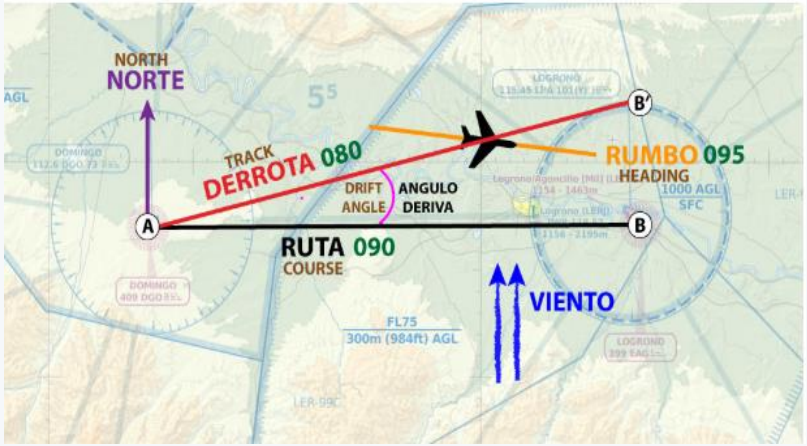
INSTRUMENTAL (IFR): These are the rules that regulate the flight of aircraft using instruments for navigation and without the need for vision to operate.

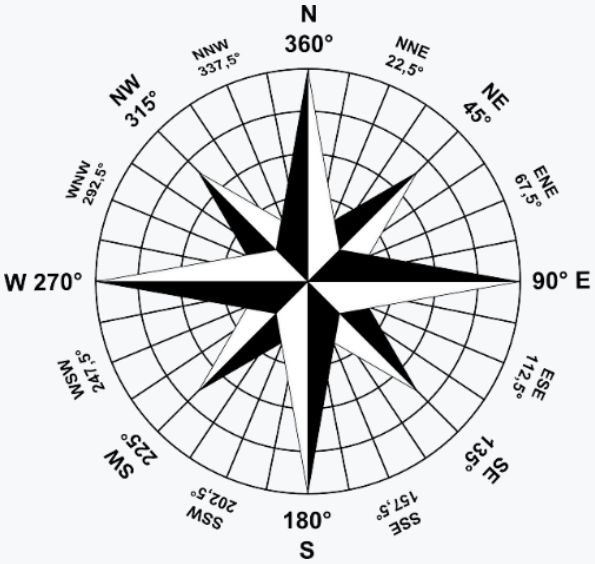
	VFR	IFR
VMC	✓	✓
IMC	✗	✓

BASIC CONCEPTS ORIENTATION

COURSE: It is the flight path planned on the navigation chart, that is, the route to be completed, on the surface of the earth.

TRACK: Es la trayectoria real, sobre la superficie del terreno, recorrida en el vuelo.

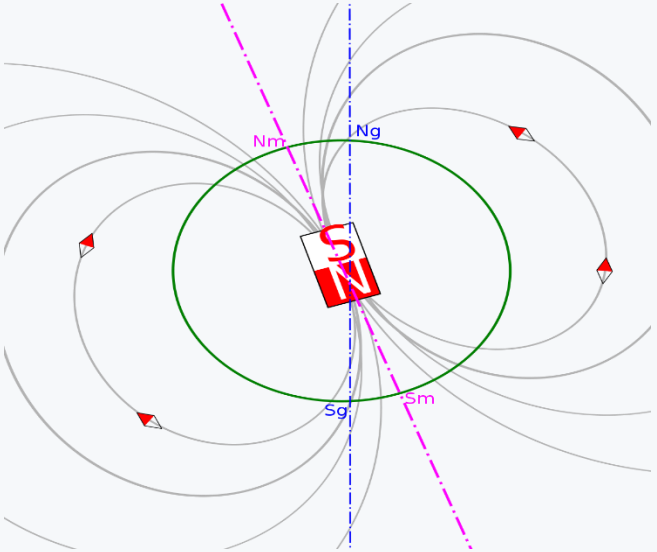




HEADING: It is the direction in which the nose (nose) of the plane is oriented.

DRIFT ANGLE: it is the angle formed between the route and the defeat.

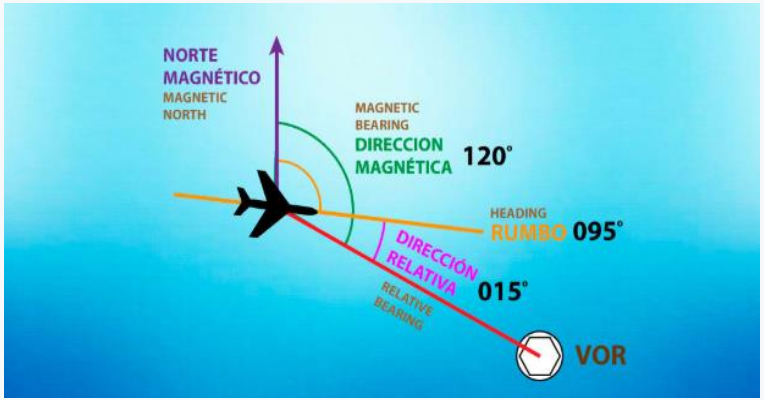
BASIC CONCEPTS ORIENTATION



GEOGRAPHIC NORTH: measured on the navigation chart, that is, the one referring to the geographical position of the north pole

MAGNETIC NORTH: This terrestrial magnetic corresponds to the north indicated by the compass needle.

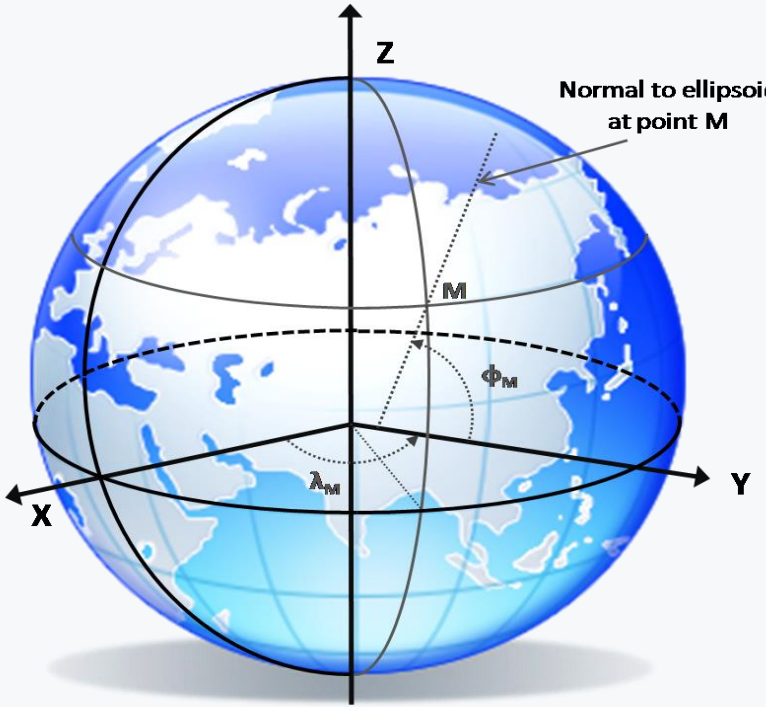
MAGNETIC VARIATION: is the angle formed between true north and magnetic north



RELATIVE BEARING: It is the angle formed between the location of a distant point and the heading of the plane. It is also sometimes referred to as self-marking.

MAGNETIC BEARING: It is the angle formed between the location of a distant point and magnetic north, measured from the position of the plane. It is also sometimes called magnetic marking

BASIC CONCEPTS LOCATION



LATITUDE

- ECUADOR
- NORTH (POSITIVE) – SOUTH (NEGATIVE)
- 0° TO 90°

LONGITUDE

- PRIME MERIDIAN
- EAST (POSITIVE) – WEST (NEGATIVE)
- 0° TO 180°

SYSTEMS CONVERSION

- DECIMALS
- SEXAGESIMALS

ALTIMETRY

TRANSITION LEVEL

QNE – FLIGHT LEVEL

TRANSITION LAYER

TRANSITION ALTITUDE

QNH – ALTITUDE

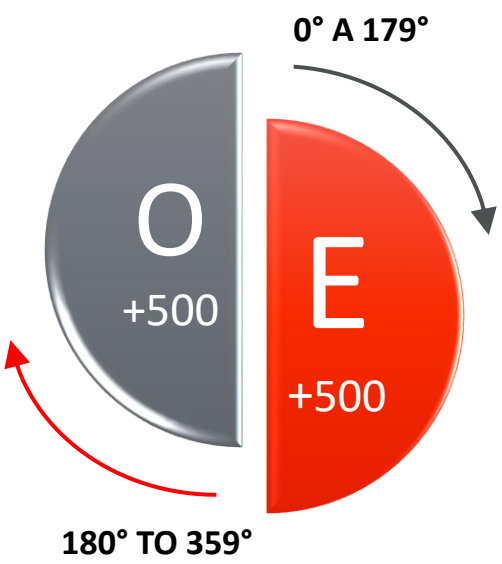
QFE – HEIGHT

ELEVATION

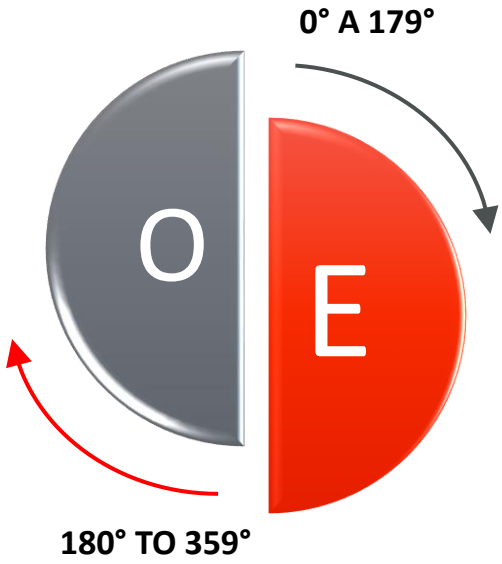
PRESSURE 1013 HP /29.92 HG

MSL PRESSURE

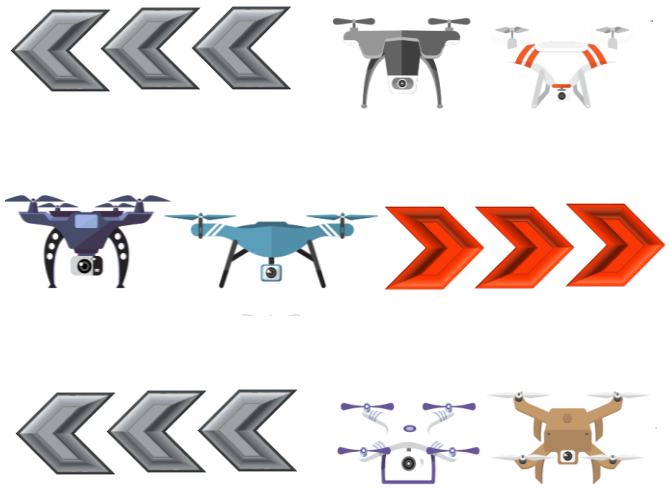
VERTICAL SEPARATION



VFR FROM SURFACE TO FL 245

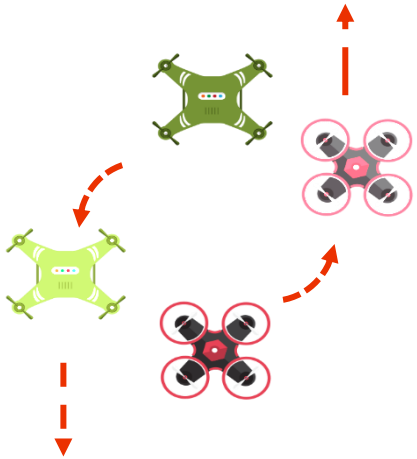


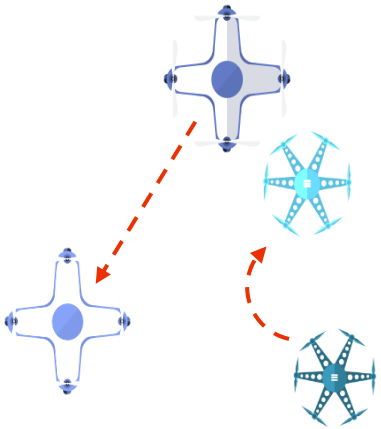
IFR FROM AIRSPACE MINIMUM TO FL 290

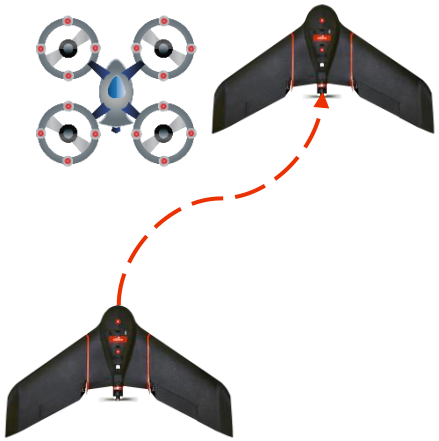


COLLISION VOIDANCE

"... The pilot-in-command shall not operate an aircraft so close to another that it may cause a collision hazard..."







AIRSPACES

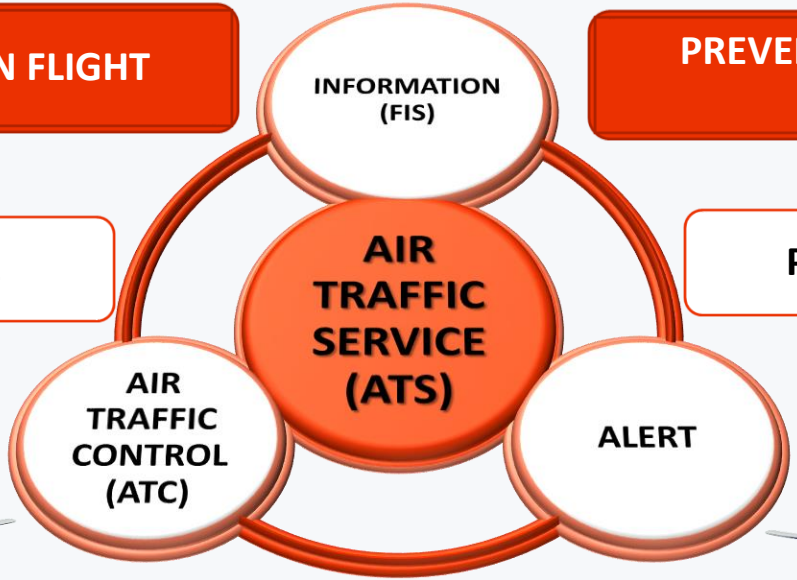
Portion of the earth's atmosphere, on land or water, that is regulated by a particular country. According to the type of operations it hosts, the level of security and the movement of aircraft.

PREVENT COLLISIONS IN FLIGHT

PREVENT COLLISIONS ON THE SURFACE

ORDERING AIR TRAFFIC

PROVIDE INFORMATION



NOTIFY THE SEARCH AND RESCUE COORDINATION CENTRE

AIR SPACE

UIR

FL 245

FIR

A AWY AND TMA FROM FL 195 (UNL)	IFR	VFR
F NO CONTROLLED FL 245 TO FL 450	IFR	VFR
B (AWY AND TMA FROM FL 145 TO FL 195) CTR WITH RADAR	IFR	VFR
C AWY AND TMA CTR UP TO FL 145. CTR AND ATZ BY INSTRUMENTS	IFR	VFR
D ATZ CONTROLLED WITHOUT INSTRUMENTS	IFR	VFR
G NO CONTROLLED (VFR RUNNERS / NO CONTROLLED)	IFR	VFR
GND		

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INTERPRETATION OF AERONAUTICAL CHARTS

AERONAUTICAL CHARTS

"It is the representation of a portion of the earth, its relief and constructions, specially designed to meet the requirements of air navigation."

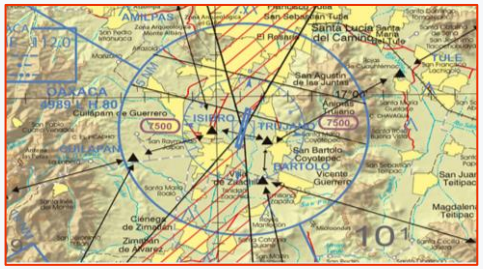
ANNEX 4 – ICAO AERONAUTICAL CHARTS

THEY ARE USED IN DIFFERENT PHASES OF MANOEUVRING

- **TAXIING**
- **TAKE OFF AND CLIMBING**
- **ATS STRUCTURE ON ROUTE**
- **DESCENT AND APPROACH**
- **ARR APPROACH AND FRUSTRATED**
- **LANDING AND TAXIING**

17 TYPES OF AERONAUTICAL CHARTS

VFR CHARTS

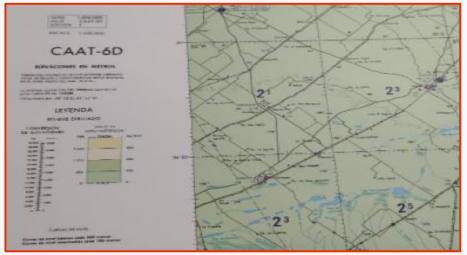


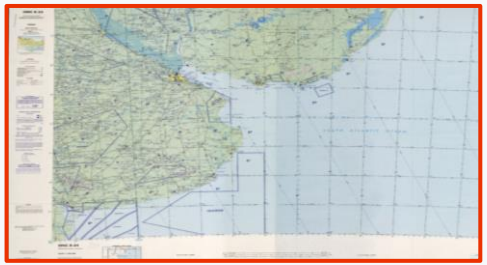
TERMINAL CHARTR

- SCALE: 1:250000
- CONDITIONAL
- 1 CM – 2,5 KMS
- MORE DETAIL – COMPLEX AIRFIELD VFR PROCEDURES

SECTIONAL CHAR

- SCLAE: 1:500000
- OPTIONAL
- 1 CM – 5 KMS
- INTERMEDIATE DETAILS – NAV SHORT DISTANCE AND LOW SPEED

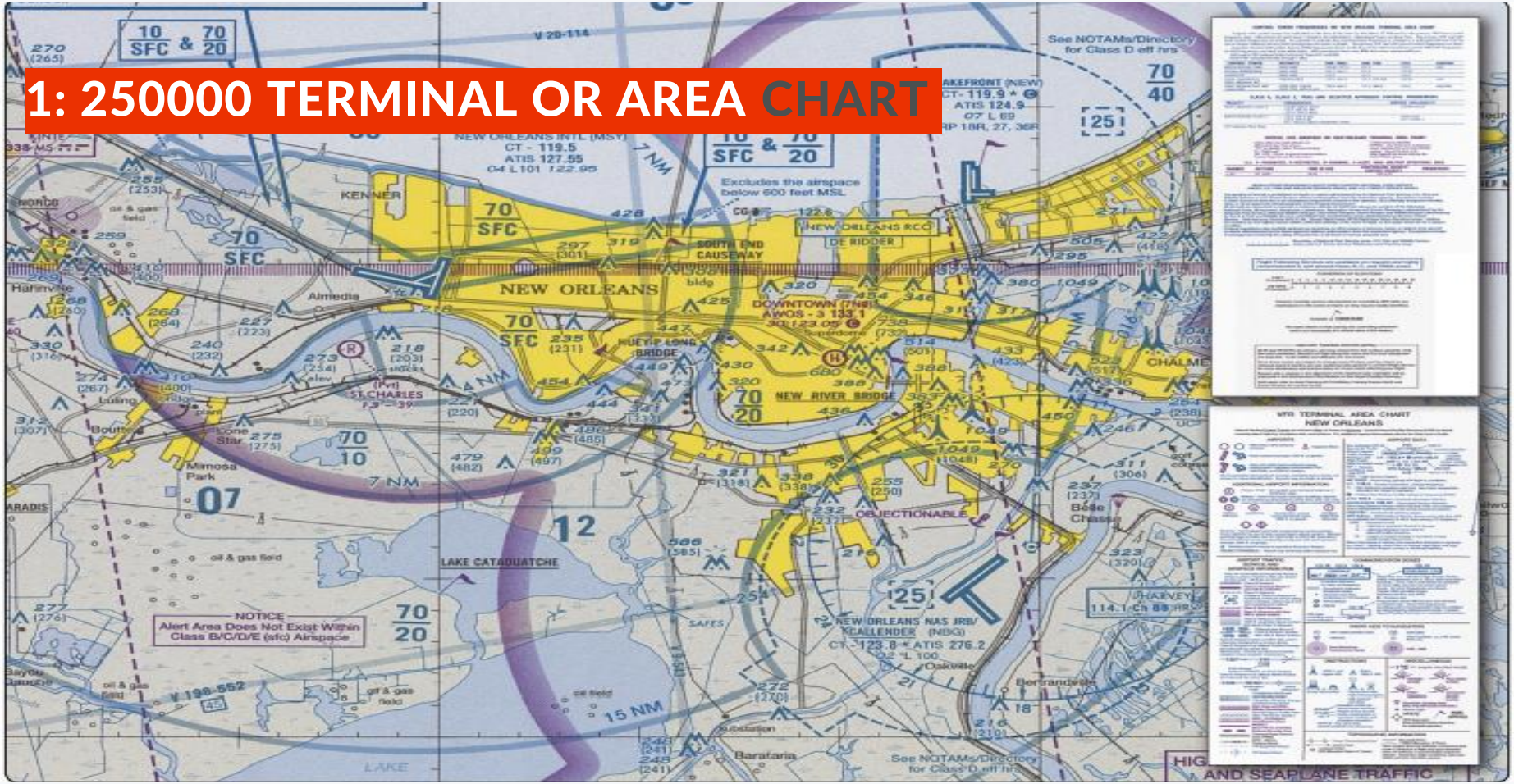




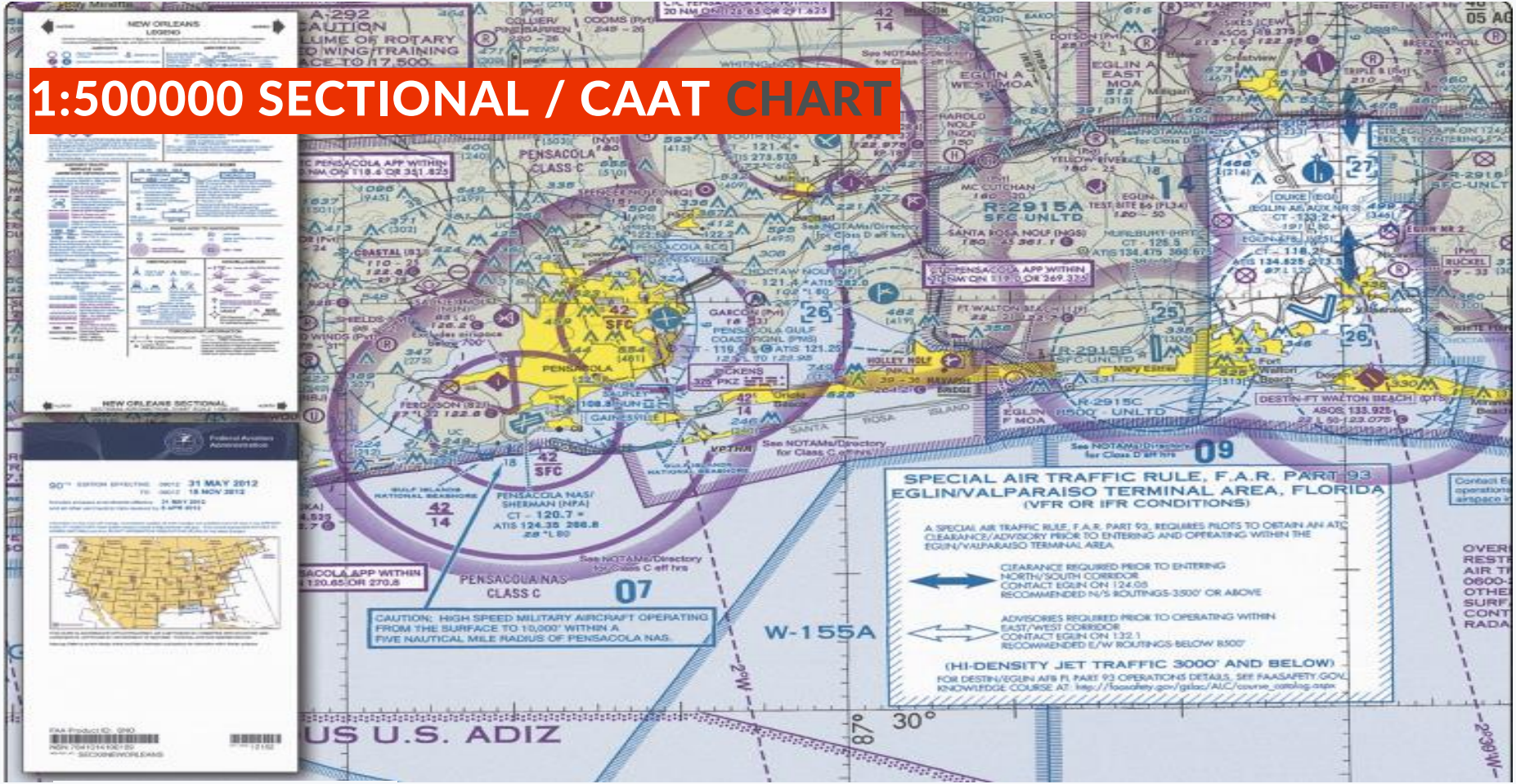
CARTA MUNDIAL/WAC

- SCALE: 1:1000000
- MANDATORY
- 1 CM – 10 KMS
- FEW DETAILS – LONG-RANGE NAVIGATIONS

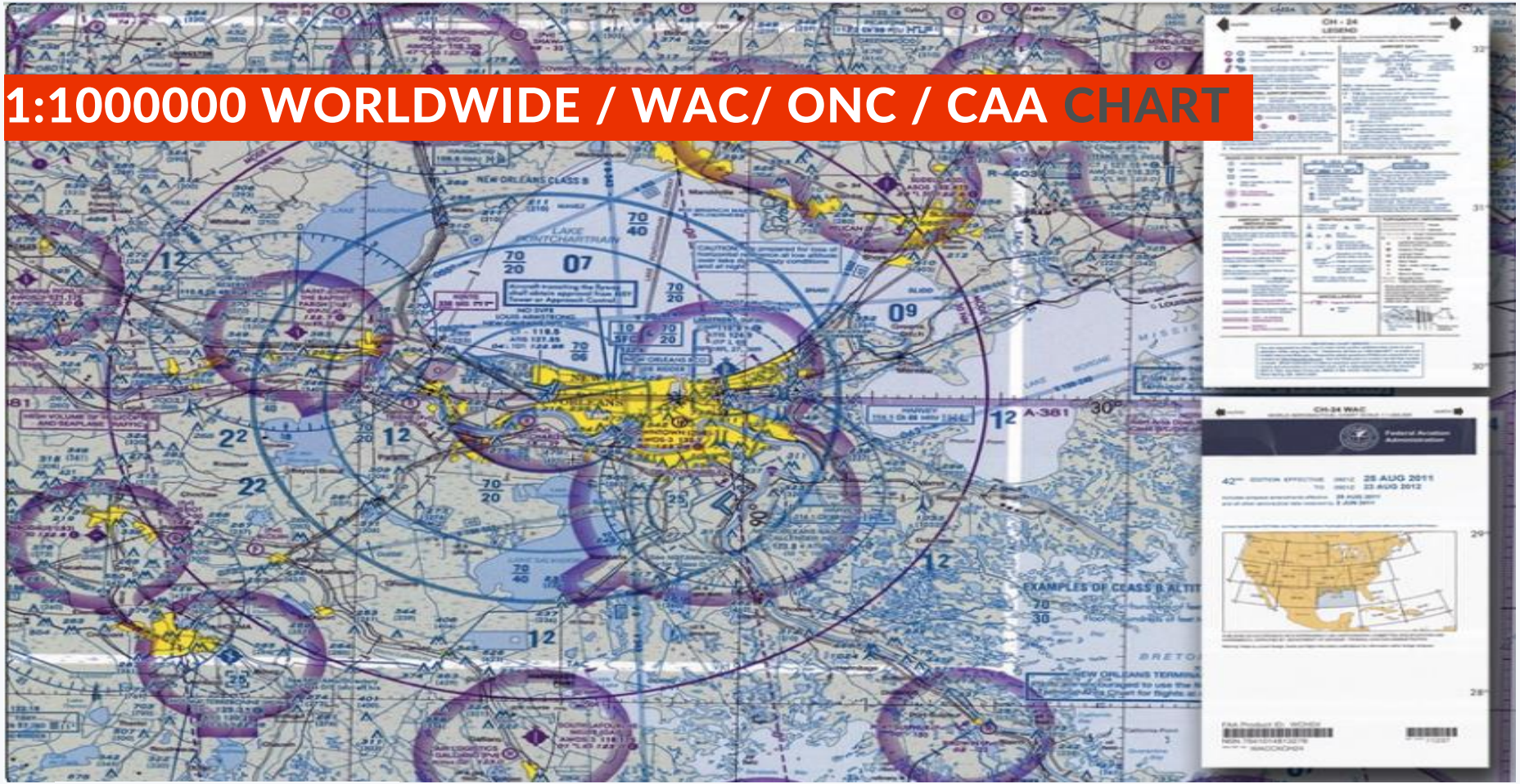
1: 250000 TERMINAL OR AREA CHART



1:500000 SECTIONAL / CAAT CHART



1:1000000 WORLDWIDE / WAC/ ONC / CAA CHART

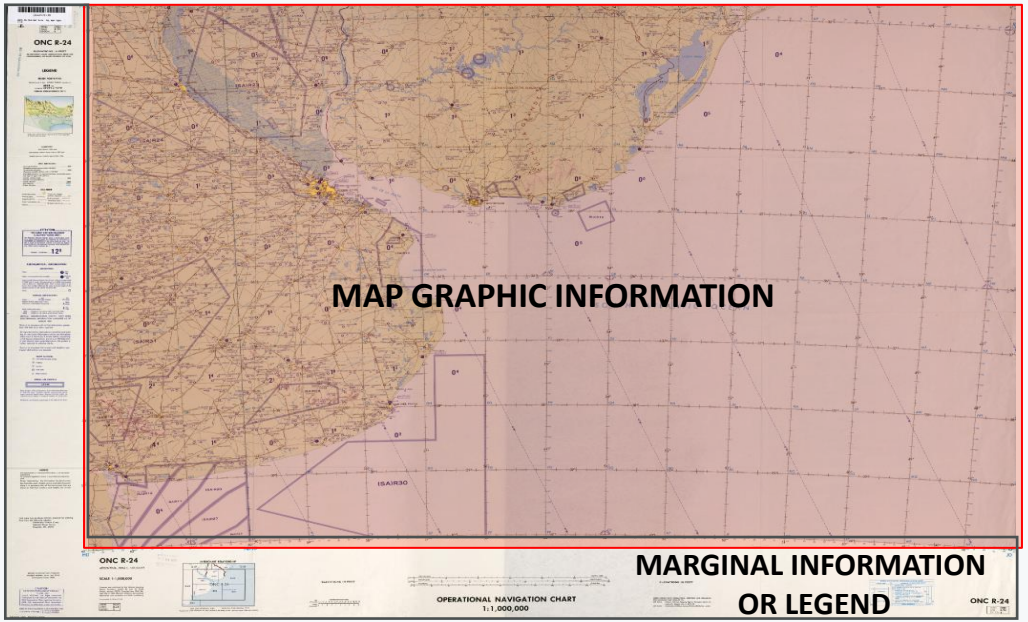


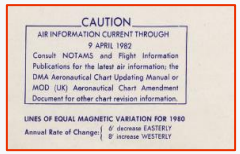
VFR CHARTS INFORMATION

CHART TYPE

TERRAIN RELIEF

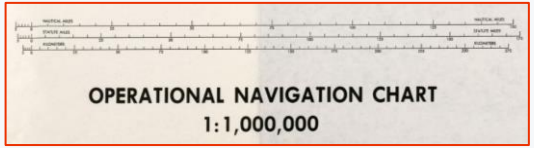
AERONAUTICAL SYMBOLOGY AND INFORMATION





DATE

POSITION

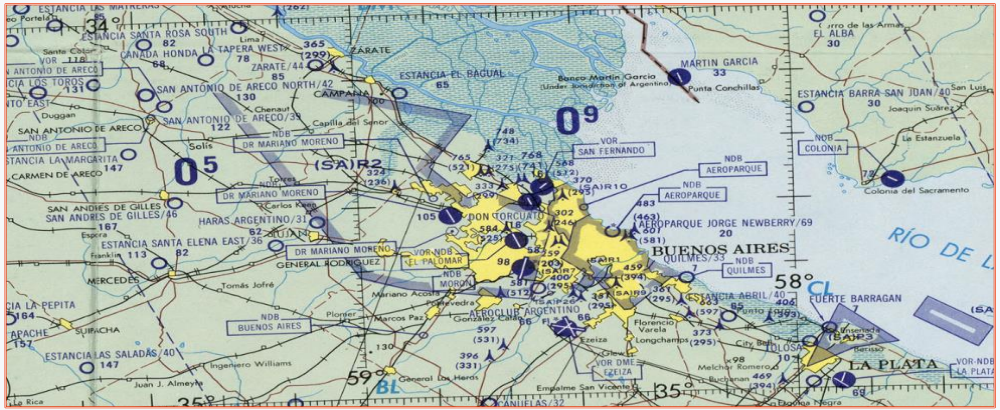


SCALE

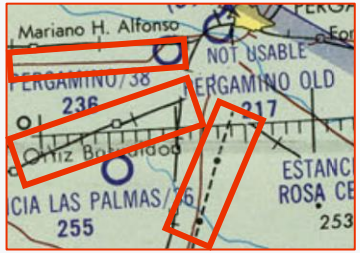
GRAPHIC INFORMATION OF VFR CHARTS

AIRPORTS, AERODROMES AND LAD(S)

MAGNETIC DECLINATION



RESTRICTED AND PROHIBITED AREAS



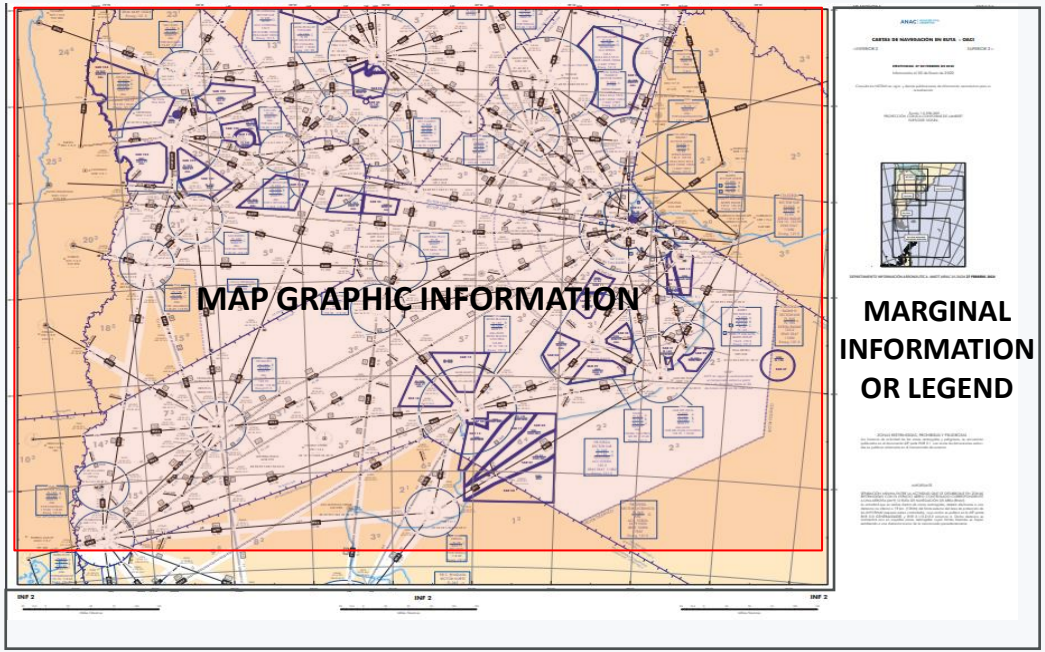
ROUTES, POWER LINES AND RAILWAYS

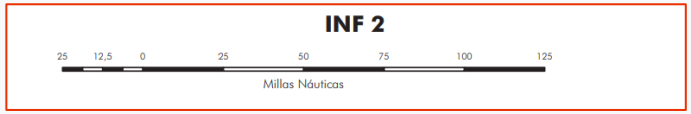
OBSTACLES, POINTS AND MAXIMUM ELEVATION

RADIO AIDS

GRIDS

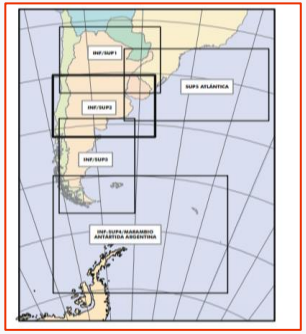
IFR CHARTS INFORMATION



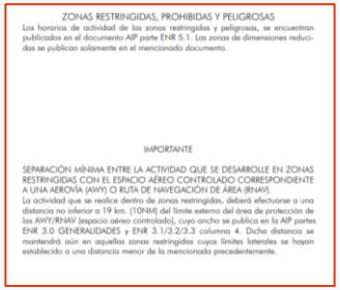


GRAPHIC SCALE AND LEVEL

NAME AND DATE



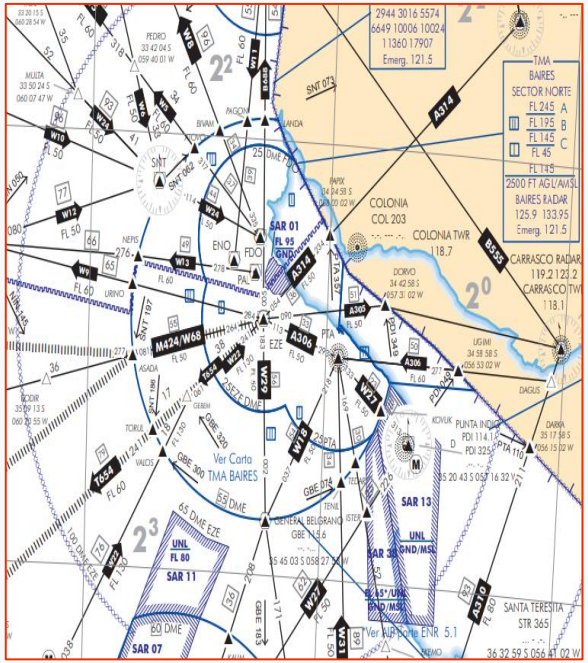
POSITION



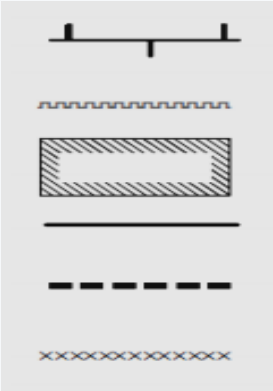
RELEVANT INFORMATION AND PROHIBITED OR DANGEROUS RESTRICTED AREAS

GRAPHIC INFORMATION OF IFR CHARTS

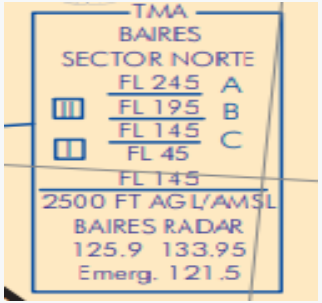
AIRSPACE LIMITS



HORIZONTAL



VERTICAL

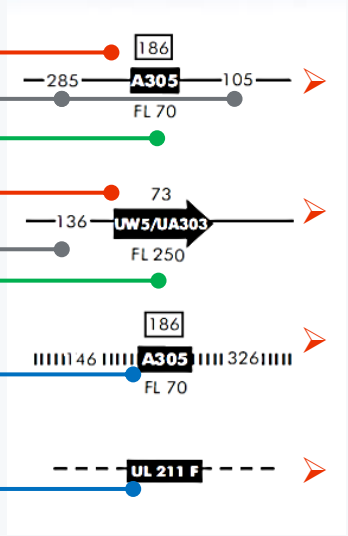


- FLIGHT INFORMATION REGION (FIR)
- COMMUNICATIONS CONTROL SECTOR
- PROHIBITED, RESTRICTED OR DANGEROUS AREA
- TERMINAL CONTROL AREA(TMA)
- CONTROL ZONE(CTR)
- CONTROL AREA(CTA)
- TYPE OF AIRSPACE (TMA-CTR-ATZ-CTA-AWY-FIR, ETC)
- CLASSIFICATIONS OF AIRSPACE(A,B,C)
- VERTICAL LIMITS OF AIRSPACES
- COMMUNICATION SIGN
- FREQUENCIES

GRAPHIC INFORMATION OF IFR CHARTS

AIRWAYS

- **DISTANCE**
- **COURSE**
- **MINIMUM FLIGHT LEVEL**
- **NAME**

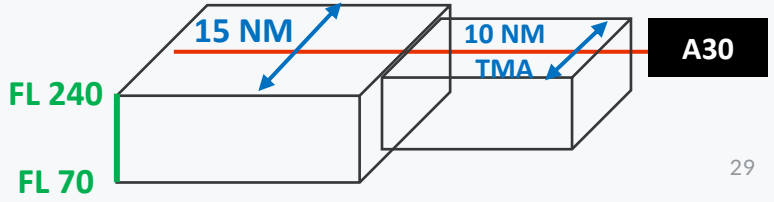


TWO-WAY AIRWAY

ONE-WAY AEROVÍA

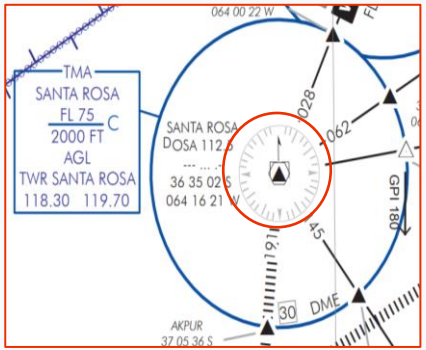
RNAV AIRWAY

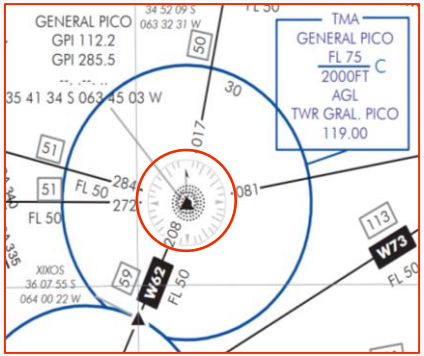
CONTINGENCY SYSTEM AIRWAY



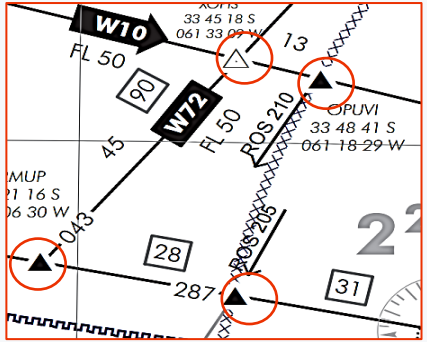
GRAPHIC INFORMATION OF IFR CHARTS

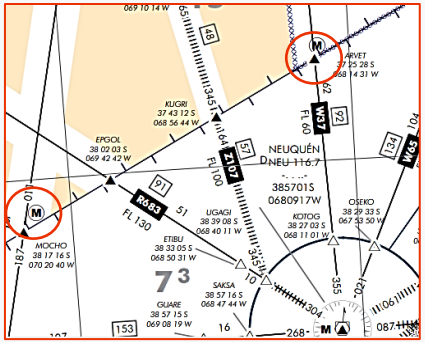
RADIO AIDS



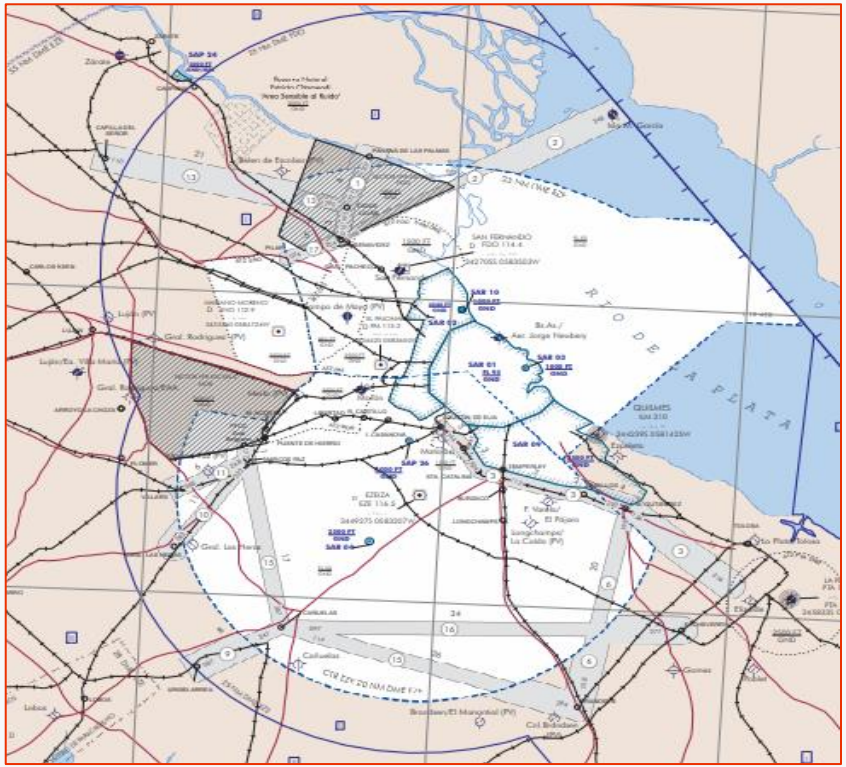


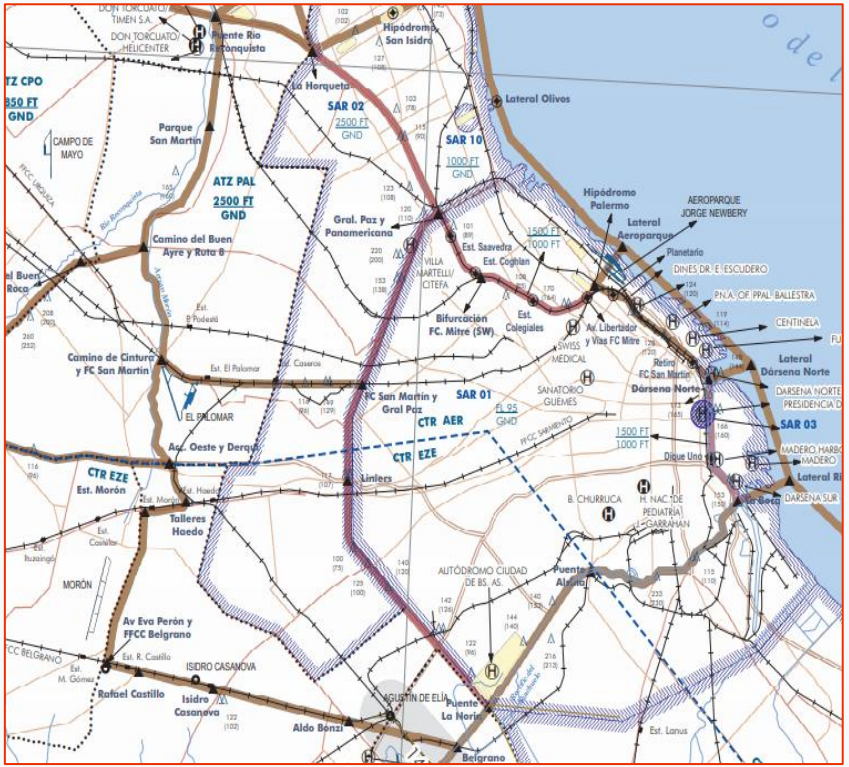
NOTIFICATION POINTS





VISUAL CORRIDORS AND HELICORRIDORS





FLIGHT PLANNING

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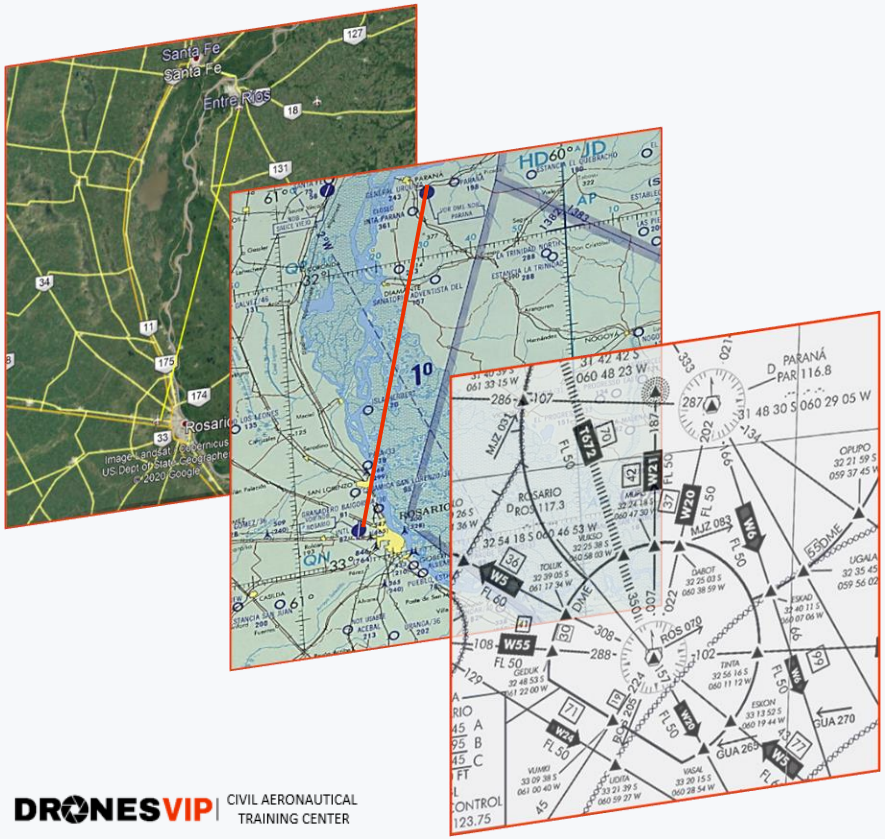
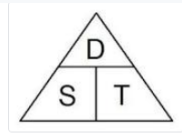
PLANNING FLIGHT



PROCESSES

- INITIAL RECOGNITION
- WEATHER (FORECAST)
- NAVIGATION
  - ➢LINE ORIGIN AND DESTINATION
  - ➢RESTRICTIONS (TYPE OF AIRSPACE- OROGRAPHY- NOTIFICATION/CONTROL POINTS)
  - ➢COURSE/ALTITUDE
  - ➢DISTANCE
  - ➢VELOCITY
  - ➢TIME
- WEIGHT AND BALANCE
- FUEL
- TECHNICAL CONDITIONS OF THE AIRCRAFT
- NOTAMS
- WEATHER (CURRENT)
- FREQUENCIES/HOURS OF OPERATION
- FLIGHT RISK ANALYSIS



FLIGHT PLAN

AIRCRAFT ID		FLIGHT RULES
AIRCRAFT TYPE		FLIGHT TYPE
TAKEOFF TIME		CATEGORY
DEPARTURE		APPROVED EQUIPMENT
CRUISE SPEED		ROUTE
FLIGHT LEVEL		ALTERNATIVES
DESTINATION		FLIGHT TIME
AUTONOMY		INFORMATION
PEOPLE ON BOARD		EQUIPMENT COM EGA
SURVIVAL		PILOT DATA
AIRCRAFT COLOR		PRESENTED BY

AERONAUTICAL COMMUNIATIONS

"… Those who operate radio stations must have their Telecommunications Operator Certificate issued by the national telecommunications authority..."

START-UP

- **ID AERODROME – ID AIRCRAFT – POSITION – REQUEST START UP – FOR COMPLY FLIGHT PLAN –** ***EX SAN FERNANDO GROUND VNT 019 ON POSITION ALFA REQUESTING START UP FOR COMPLY FLIGHT PLAN.***

TAXIING

- **ID AERODROME – ID AIRCRAFT – WITH START UP COMPLETE – REQUESTING TAXIING TO RUNWAY IN USE – NAVEGATION VFR TO DESTINATION.** ***EX SAN FERNANDO GROUND VNT 019 WITH START UP COMPLETE REQUESTING TAXIING TO RUNWAY IN USE FOR NAVEGATION VFR TO PARANÁ.***

TAKEOFF

- **ID AERODROME – ID AIRCRAFT READY FOR DEPARTURE.** ***EX SAN FERNANDO VNT 019 READY FOR DEPARTURE***

CRUISE

- **ID AERODROME – ID AIRCRAFT – AIRCRAFT TYPE- VFR NAVIGATION– AD DEPARTURE – AD ARRIVAL – POSITION – ALTITUDE – ETA ARRIVAL.** ***EX PARANA TOWER VNT 019 AIRCRAFT INSPIRE 1 NAVEGATION VFR FROM SAN FERNANDO DESTINATION YOUR AERODROME, VERTICAL VICTORIA CITY 1000 FT – ESTIMATED ARRIVAL 1230z.***

DESCENT AND LANDING

- **ID AERODROME – ID AIRCRAFT – POSITION - ALTITUDE – ETA – REQUESTING DESCENT AND INSTRUCTIONS FOR ARRIVE.** ***EX PARANA TORRE VNT 019 VERTICAL DIAMANTE CITY 1000 FTS REQUESTING DESCENT AND INSTRUCTIONS FOR ARRIVE.***

ENGINE CUTTING

- **ID AERODROME – ID AIRCRAFT– POSITION – FREQUENCY.** ***EX PARANA GROUND VNT 019 POSITION ALFA FREQUENCY.***

QUESTIONS TIME!

DRONESVIP
CAPACITATION