SAN JUAN CERAP
TOWER CAB TRAINING MANUAL

Revision: 2022/09
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DOCUMENT INFORMATION

Purpose

This document prescribes the training requirements, procedures and standards to operate the Clearance Delivery, Ground and Tower controller positions at the San Juan CERAP. This document is intended to serve as a reference for controllers to use in preparation for their training sessions and as a tool for continuing education once certified.

Distribution

The San Juan CERAP Training Manual is distributed to all controllers of San Juan CERAP.

Responsibility

This document is the responsibility of the San Juan CERAP Air Traffic Manager and Training Administrator to maintain. The document is to be approved by the VATSIM Caribbean Division Training Director prior to release.

Updates and Changes

This is version B of the the training manual. Any updates or changes to this document are noted in the Table of Revisions section of this document.

Cancellation

This document cancels any previous release version of the San Juan CERAP Tower Cab Training Manual published prior to 2022/09/18 (September 18, 2022).

TABLE OF REVISIONS

Date	Revision	Editor
2022/07/01	A - Initial Release	Jannes van Gestel
2022/10/01	B - Minor Revisions - Updated airspace diagrams - Updated navigation definitions - Added figure legends - Removed Section 9. Document Change Log	Francis Reilly

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PREFACE

Welcome to San Juan CERAP!

San Juan CERAP is part of the Caribbean Division of the VATSIM network (VATCAR). We are pleased you have chosen to join our team of controllers.

The San Juan CERAP (Combined En-Route Radar Approach Control) is strategically located in the Caribbean and handles a major part of the International route structure and traffic volume for the Eastern Caribbean area. Our airspace is complex in nature since it makes use of a combination of FAA, ICAO and Oceanic procedures.

The following document is designed to help you become familiar with the Air Traffic Control (ATC) knowledge required to become a proficient Delivery, Ground and Tower controller.

We are here to ensure you succeed in your goal of becoming a VATSIM air traffic controller and look forward to working with you.

Francis Reilly
Air Traffic Manager
San Juan CERAP
VATSIM Caribbean Division

1. VATSIM EXPLAINED

1.1 VATSIM Caribbean Division

VATCAR is composed of a series of Flight Information Regions (FIRs) including the San Juan CERAP. Each facility is managed by an Air Traffic Manager (ATM) that reports directly to the Division Director (VATCAR1). During your registration process, you selected San Juan CERAP as your home facility. The training team is responsible for your progression through all VATSIM controller ratings from Observer (OBS) to Controller 1 (C1).

The San Juan CERAP staff includes:

- Air Traffic Manager (ATM)
- Deputy Air Traffic Manager (DATM)
- Training Administrator (TA)
- Facility Engineer (FE)
- Events Coordinator (EC)
- Webmaster (WM)
- Training Team (composed of Mentors)

1.2 VATSIM Ratings

In order to provide a standardized way of identifying a controller's duties and responsibilities, VATSIM has established the following ratings system.

- OBS - Observer
    - The OBS rating is automatically assigned to any person who registers to become an air traffic controller on the VATSIM network.
    - This rating allows you to connect to the network using any ATC client and monitor traffic communications on any active position.
    - The maximum visibility range for an OBS is 300 nautical miles.
    - **You are NOT authorised to actively control or communicate with ANY aircraft. This is a watch and listen ONLY rating.**

- S1 - Student 1
    - The S1 rating is conferred after successfully completing your initial training and passing the S1 OTS (Over the Shoulder) exam.
    - This rating allows you to connect to authorized Clearance Delivery (DEL) and Ground Control (GND) positions within the lateral boundaries of the San Juan CERAP.

    - Ground (GND) controllers have positive control of all aircraft on the movement areas of an airport, with the exception of active runway(s).
    - The maximum visibility range for Clearance Delivery (DEL) and Ground (GND) is 20 nautical miles (NM).
    - Once you have controlled at least 20 hours as an S1 you will be eligible for S2 training.
    - S1 rated controllers can operate the SJU_TWR position upon receipt of a student solo endorsement.

- S2 - Student 2
    - The S2 endorsement is obtained after successfully completing the S2 training and passing the S2 OTS.
    - Tower (TWR) controllers have positive control of all aircraft on the active runway(s) and local airspace surrounding the airport.
    - The maximum visibility range for Tower (TWR) is 50 nautical miles.
    - Once you are working a TWR position, if no GND and/or DEL controller is online within the same Cab, you also assume control of those positions. This is known as top-down controlling.

- S3 - Student 3
    - Once you have controlled at least 20 hours on any Tower (TWR) position with your S2 rating you will be eligible for S3 training.
    - After completing this training and successfully passing another OTS, you will be endorsed as an S3 controller.
    - This rating will allow you to connect to authorized approach (APP) and departure (DEP) positions within the lateral boundaries of your home facility.
    - These positions can also be controlled using the top-down concept to include covering TWR, GND, and DEL.
    - Approach (APP) and Departure (DEP) controllers have positive control of most aircraft within the terminal area.
    - The size and dimension of the terminal airspace is unique to each facility.
    - The maximum visibility range for Approach (APP) and Departure (DEP) is 150 nm.

- C1 - Controller 1
    - Once you have controlled at least 20 hours on any Approach (APP) or Departure (DEP) postion with your S3 rating you will be eligible for C1 training.
    - After completing this training and successfully passing another OTS, you will be endorsed as an C1 controller.
    - This rating will allow you to connect to authorised Center (CTR) positions within the lateral boundaries of your home facility.

- Center (CTR) controllers provide en route services to all aircraft within the lateral boundaries of the CERAP.
- These positions can also control using the top-down concept to include covering APP/DEP, TWR, GND, and DEL.
- The maximum visibility range for Center (CTR) is 600 nautical miles.

2. ATC BASICS

2.1 ATC Duties

The objective of the VATSIM network is to emulate real world air traffic control, within the limitations of the environment. The San Juan CERAP uses guidance from FAA Order 7110.65 and ICAO Doc#4444 as guides to our operations with certain limitations.

- What is the purpose of ATC?

  "The primary purpose of the ATC system is to prevent a collision between aircraft operating in the system and to provide a safe, orderly, and expeditious flow of traffic."

- What are the duties of ATC?

  "Give first priority to separating aircraft and issuing safety alerts as required. Good judgement must be used in prioritising all other provisions of the 7110.65 and 4444 based on the requirements of the situation at hand."

2.2 Clearance Delivery (DEL)

Clearance Delivery is typically the first position an aircraft will contact. This position is responsible for issuing both Visual Flight Rules (VFR) and Instrument Flight Rules (IFR) clearances. On the VATSIM network, the duties and responsibilities of Clearance Delivery are most commonly handled by the Ground Controller (GND). However during active network events, DEL may be a separate position.

2.3 Ground (GND)

The Ground control position is responsible for the safe and efficient movement of aircraft from the parking areas (ramps, gates, or aprons) to the active runway(s) for departing aircraft and to the parking areas for arriving aircraft.

2.4 Tower/Local (TWR)

The Tower controller is responsible for the active runway(s) and the airspace within the local vicinity. Their primary responsibility is to safely depart and arrive aircraft. San Juan CERAP includes 8 airports with an operating control tower:

- FAA (Domestic)
    - San Juan (SJU)
    - Isla Grande (SIG)
    - Aguadilla (BQN)
    - St. Thomas (STT)
    - St. Croix (STX)
- ICAO
    - Beef Island (TUPJ)
    - St. Maarten (TNCM)
    - Anguilla (TQPF)

In addition, San Juan CERAP has 4 uncontrolled airports where the tower only provides aerodrome information services (AFIS):

- Saba (TNCS)
- St. Eustatius (TNCE)
- St. Barths (TFFJ)
- Grand Case (TFFG)

2.4 Terminal (APP/DEP)

The Terminal controller is a radar position that oversees a larger geographic area. This position may be staffed by one individual, or responsibilities may be divided.

- The Approach controller is responsible for safely getting aircraft from the enroute environment to the terminal area (prior to local control).
- The Departure controller is responsible for safely getting aircraft from the terminal area (after departing local control) to the enroute environment.

San Juan CERAP includes 2 terminal areas with approach/departure positions:

- San Juan Approach (FAA) extending up to 10,000ft MSL
- Juliana Approach (ICAO) extending up to FL150.

2.5 Center (CTR)

The Center controller is responsible for providing en-route separation, and traffic/weather advisories to all aircraft within the lateral boundaries of our airspace. The center controller assumes top-down coverage of all staffable positions within San Juan CERAP when no other controllers are online.

3. AIRSPACES

3.1 Overview

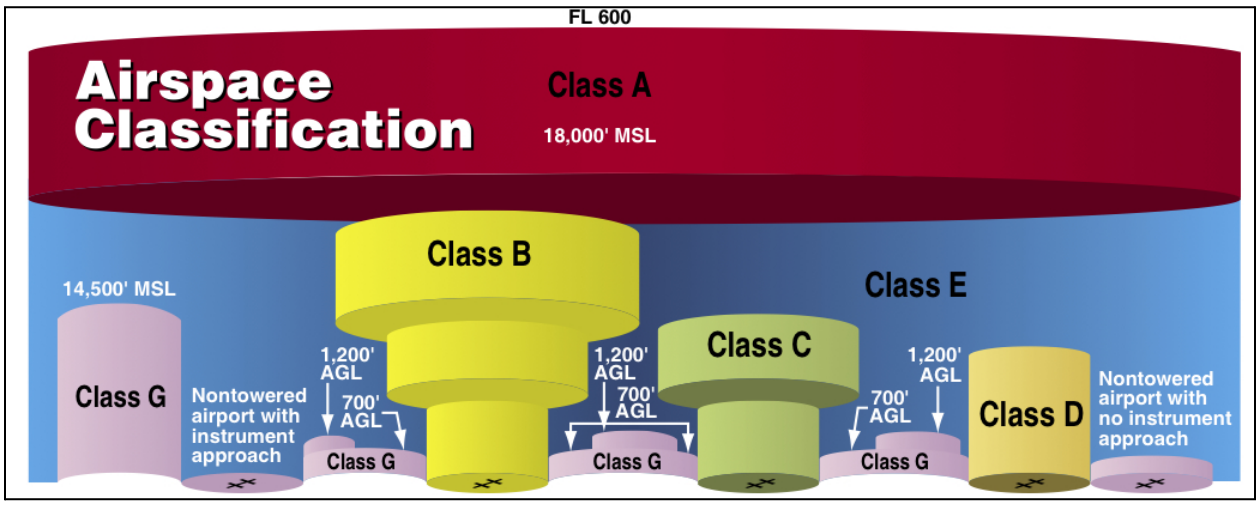

Figure 1. Depiction of Controlled Airspace within the FAA National Airspace System (NAS). (www.faasafety.org)

3.2 Class A

Within the San Juan CERAP, Class A airspace begins at 18,000ft MSL (FL180) extending upwards to 60,000ft MSL (FL600). Class A airspace is not depicted on aeronautical charts. To enter Class A airspace, aircraft must be on an IFR flight plan. No VFR traffic is allowed in Class A airspace.

3.3 Class B (Bravo)

The most restrictive type of airspace and found around large airports. The airspace typically resembles an upside-down wedding cake having altitude shelves extending outwards from the center. Shelf altitudes can be found on the aeronautical chart; boundaries are depicted by solid blue lines or curves. When you encounter a Class Bravo, think “busy”.

Entry requirements for aircraft:

- Two-way radio communication (ATC has to acknowledge aircraft callsign on frequency)
- Mode C transponder
- VFR aircraft must have clearance to enter by ATC

San Juan CERAP does not have any Class B airports.

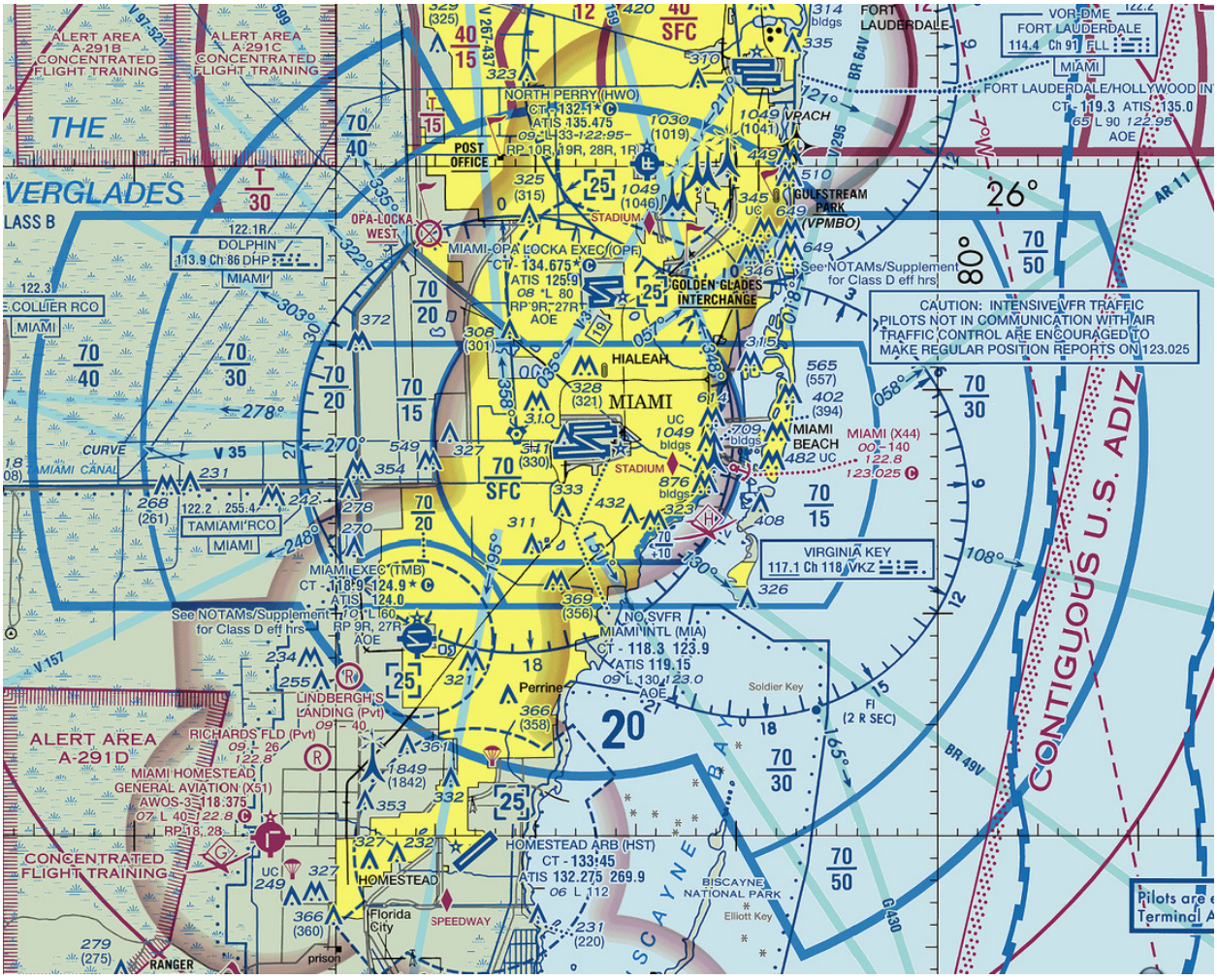

Figure 2. Miami Class Bravo Airspace. (World VFR Sectional; www.skyvector.com)

3.4 Class C (Charlie)

Commonly surrounds busy towered airports. Only two shelves of airspace that generally extend upward to 4,000ft MSL and out to 10 miles. Shelf altitudes can be found on the aeronautical chart. Boundaries depicted by solid magenta circles. When you encounter a Class Charlie, think “congested”.

Entry requirements for aircraft:

- Two-way radio communication (ATC has to acknowledge aircraft callsign on frequency)
- Mode C transponder

San Juan CERAP has three Class C airports:

- San Juan (SJU)
- St. Thomas (STT)
- St. Maarten (TNCM)

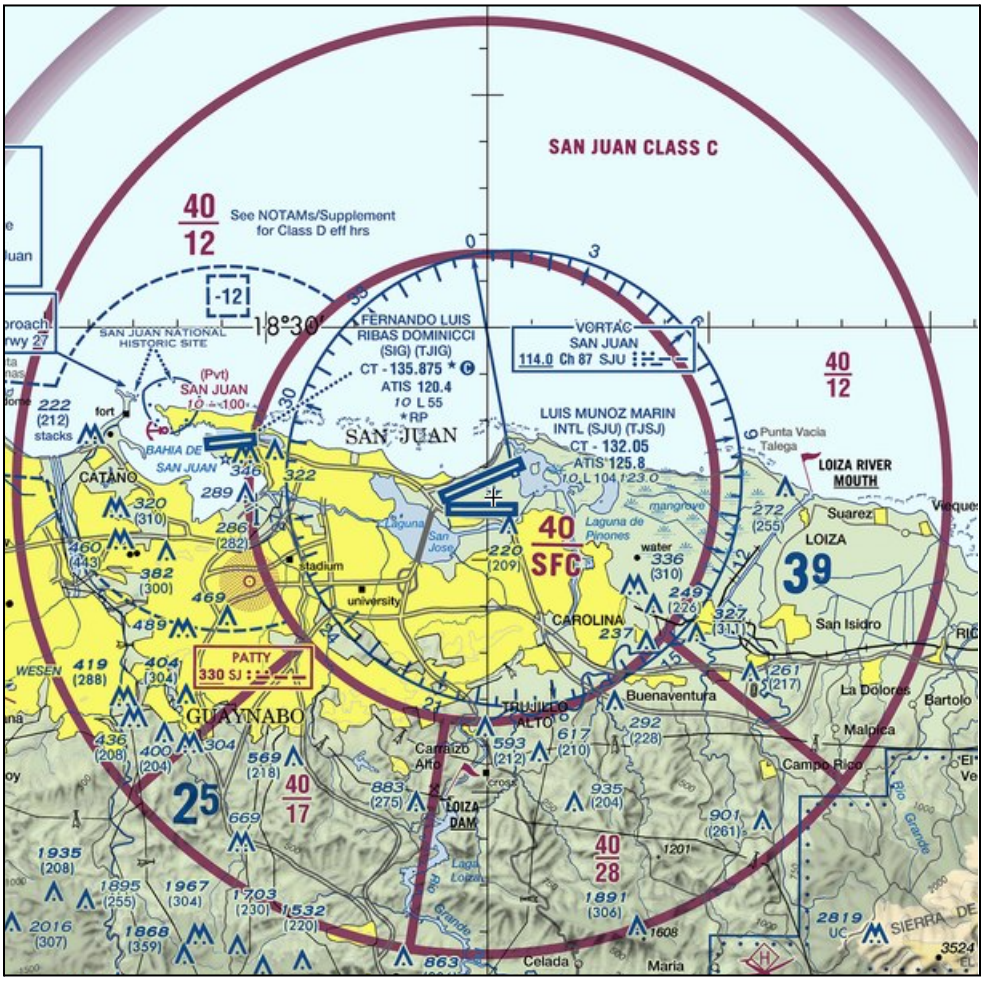

Figure 3. San Juan Class C Airspace. (Puerto Rico-VI TAC; www.skyvector.com)

3.5 Class D

Commonly surrounds towered airports with IFR traffic, but not large enough to qualify for additional restrictions. Only one circle of airspace normally extending approximately 4 miles and up 2,500ft. The airspace altitude can be found on the aeronautical chart. Boundaries depicted by dashed blue circles.

Entry requirements for aircraft:

- Two-way radio communication (ATC has to acknowledge aircraft callsign on frequency)

San Juan CERAP has five Class D airports:

- Isla Grande (SIG)
- Aguadilla (BQN)
- St Croix (STX)
- Beef Island (TUPJ)
- Anguilla (TQPF)

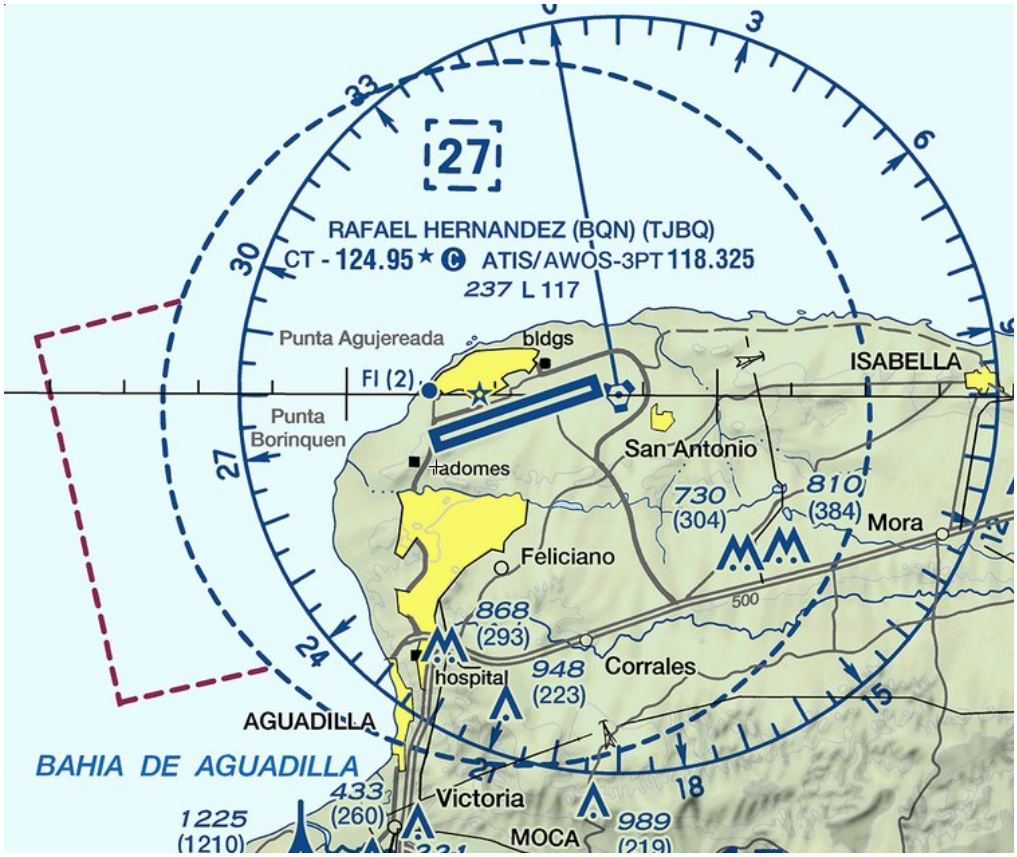

Figure 4. Aguadilla Class D Airspace. (Puerto Rico-VI TAC; www.skyvector.com)

3.6 Class E

Controlled airspace but has no special requirements. Airspace is depicted many different ways on the aeronautical charts. Can begin at the surface, 700ft above ground level (AGL), 1,200ft AGL, or others. FL600 and upwards is also Class E.

Entry requirements for aircraft:

- None

San Juan CERAP has two Class E airports:

- Mercedita (PSE)
- Eugenio María de Hostos (MAZ)

Figure 5. Mercedita Class E Airspace. (Puerto Rico-VI TAC; www.skyvector.com)

3.7 Class G

Uncontrolled airspace where ATC has no authority or responsibility for controlling air traffic. Covers all remaining airspace that has not already been discussed. It is not depicted on aeronautical charts, but can be determined by referencing the surrounding Class E airspace, but will never be higher than 14,500ft MSL.

3.8 Special Use Airspace

- Prohibited Areas
    - Airspace in which entry is NOT allowed under any circumstances except in an emergency
- Restricted Areas.
    - Airspace that is prohibited under certain conditions without an explicit clearance to enter
- Warning Areas.
    - Airspace with defined dimensions that contain hazardous conditions to non-participating aircraft.
- Military Operations Areas
    - Airspace in which military activities are regularly conducted. ATC services will usually be delegated in these areas.

3.8 Navigation

- NDB
    - Non-Directional Beacon.
    - One, two or three letter code
    - Example: DDP (Dorado), SJ (PATTY), ST (PESTE)

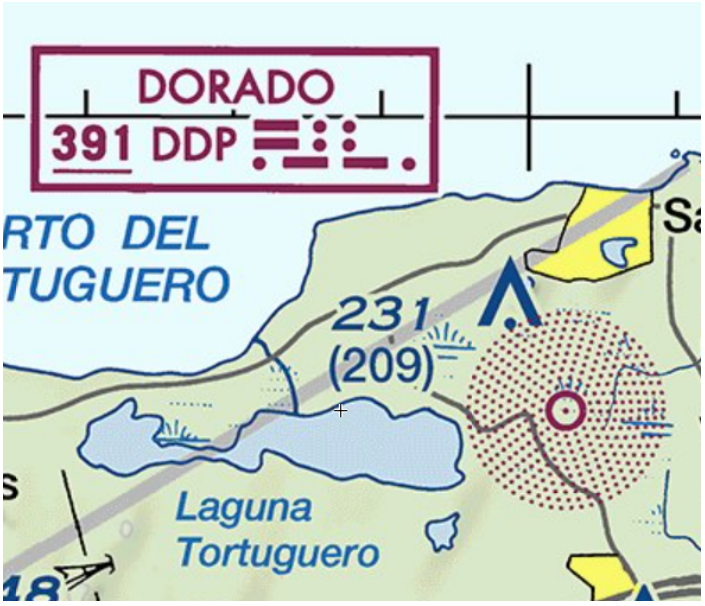

Figure 6. Dorado NDB (DDP). (Puerto Rico-VI TAC; www.skyvector.com)

- VOR
    - VHF Omnidirectional Range.
    - Three letter code
    - Example: COY (Saint Croix)

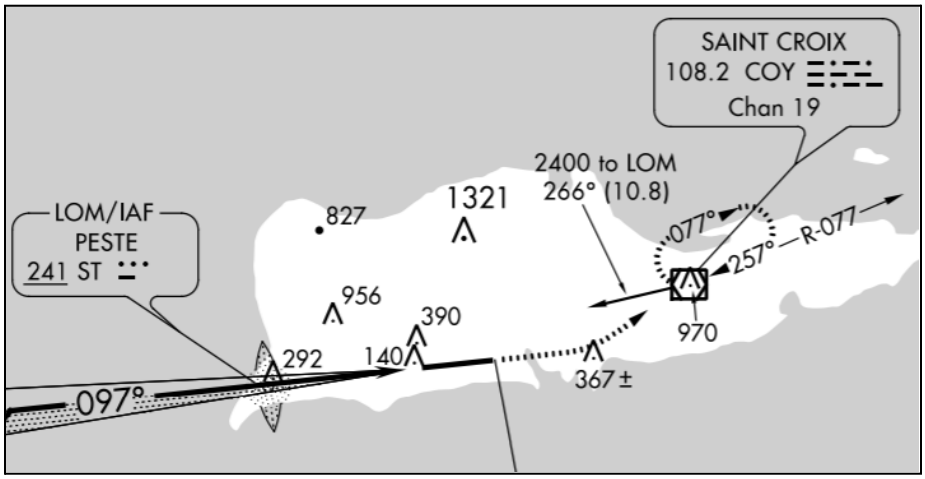

Figure 7. Saint Croix VOR (COY) and PESTE LOM (ST). (TISX - ILS or LOC 10 Instrument Approach Procedure; www.skyvector.com)

- Fix
    - Are the points or intersections along airways and airport arrival/departure procedures.
    - Can be defined in relation to ground navigational aids (NDB, VOR, TACAN) or GNSS based systems.
    - Five letter code.
    - Example: BEANO, JETSS, CHAKA

- Waypoint
    - A specified geographical location used to define an area navigation (GNSS) route or the flight path of an aircraft emplying area navigation.
    - Five letter code.
    - Example: ACONY, GLADA, DONQU
    - All waypoints are fixes, but not all fixes are waypoints.

Figure 8. Chart symbols for Fixes (black and hollow triangles) and Waypoints (blue and hollow 4-point star). (Aeronautical Information Services - Aeronautical Chart Users' Guide, FAA)

- Airways
    - The primary means for routing an aircraft under IFR.
    - Based on a centerline that extends from one navigational aid/waypoint/fix/intersection to another navigational aid/waypoint fix/intersection.
    - Navigational Aid based routes are depicted in black while Area Navigation (RNAV) routes are depicted in blue.

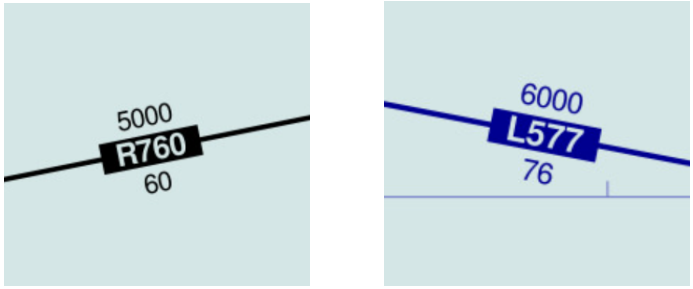

Figure 9. Chart depiction of Navaid and RNAV based airways. (World Lo; www.skyvector.com)

- Standard Instrument Departure (SID)
    - A published route aircraft use to proceed from the departure phase to the en-route phase.
    - Three types of SIDs: Radar vector, Pilot-Nav, Hybrid (explained in detail on 6.5).
    - Examples: JETSS1, GLADA3, ACONY3

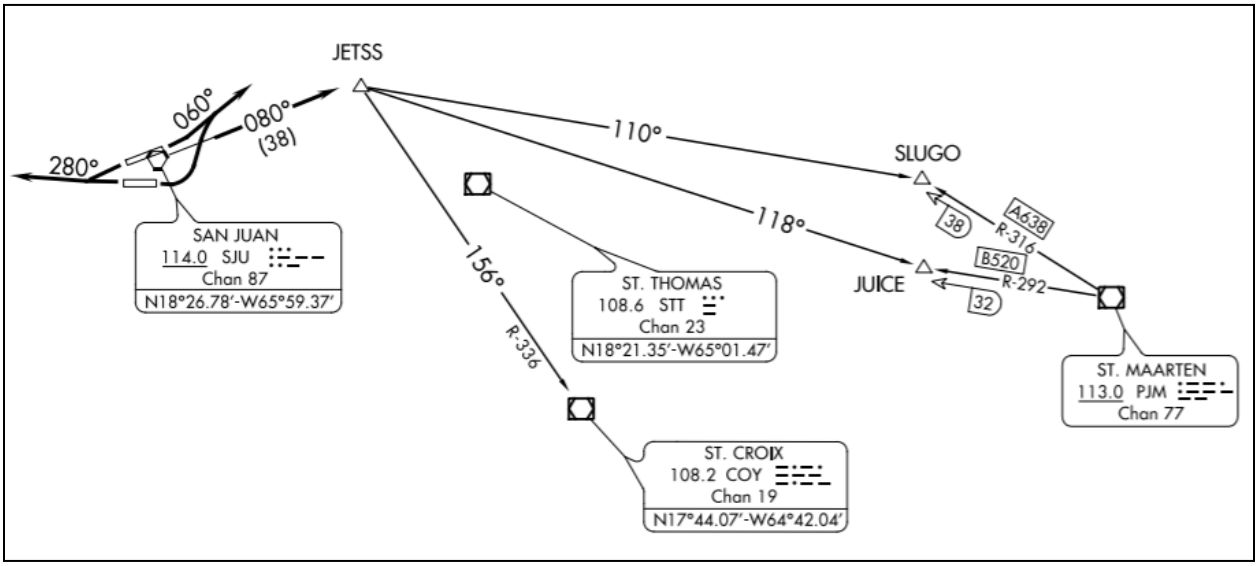

Figure 10. TJSJ - JETSS1 SID. (www.skyvector.com)

- Standard Terminal Arrival Route (STAR)
    - A published route aircraft use to proceed from the en-route phase to the approach phase.

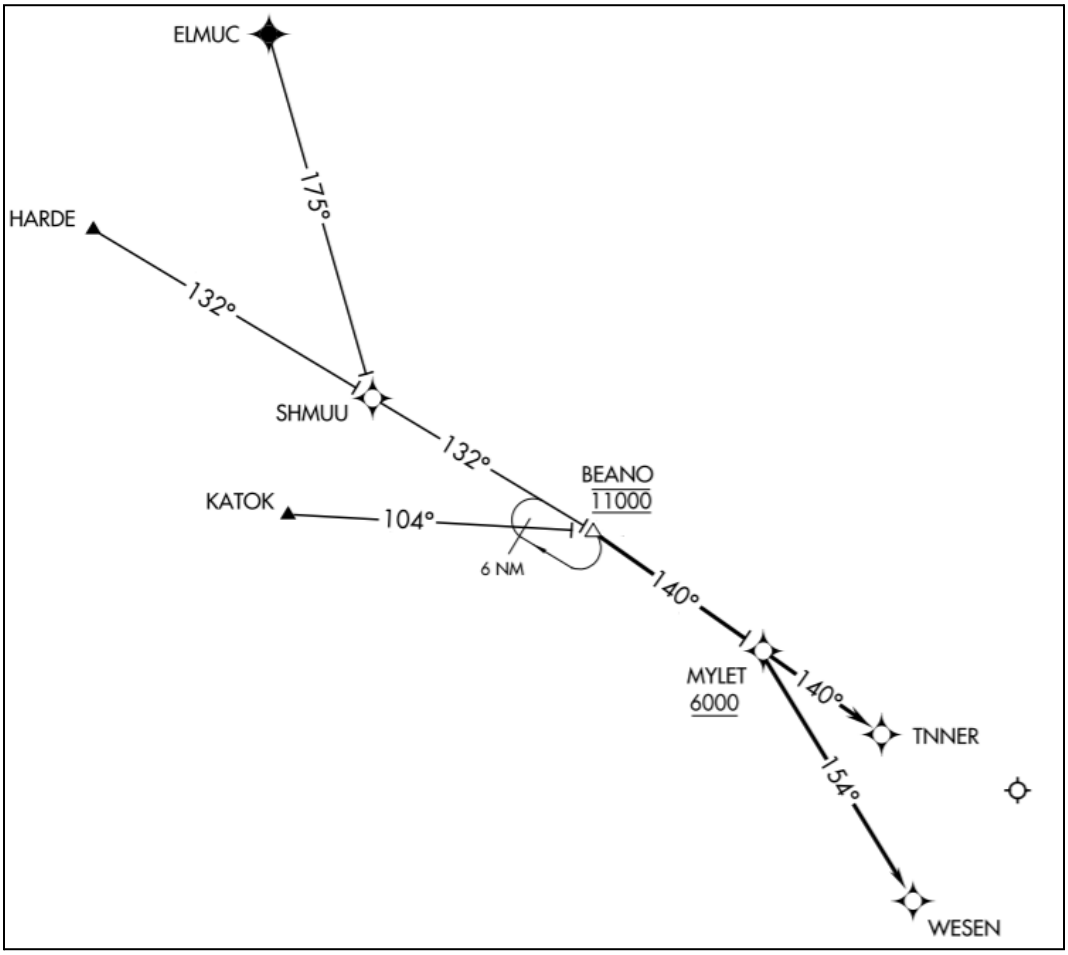

Figure 11. TJSJ - BEANO3 STAR. (www.skyvector.com)

4. WEATHER

4.1 Introduction

All the different elements of weather affect the ATC environment and aircraft within the airspace. Wind direction and velocity alter the path and speed of aeroplanes and determine the approaches/runway in use. Low visibility creates more challenging takeoffs and approaches to landing. Precipitation can reduce visibility and make aircraft braking more difficult. Usable flight levels are dependent upon atmospheric pressure.

Given that weather can make for unsafe flight conditions, this is a subject that all controllers must understand.

4.2 Clouds

Clouds are an aerosol consisting of visible mass of minute liquid water droplets, frozen crystals, or other particles that are suspended in the atmosphere. For identification purposes, you need be concerned only with the more basic cloud types, which are divided into four "families." The families are:

- High clouds (16,500ft to 45,000ft)
- Middle clouds (6,500ft to 23,000ft)
- Low clouds (Surface to 6,500ft)
- Clouds with extensive vertical development. (Unstable, often dangerous, thunderclouds)

4.3 Precipitation

Precipitation occurs when the water droplets in clouds become too heavy to remain suspended. It can fall in many forms like rain, snow, freezing rain, ice pellets, sleet, and more. It can also vary in intensity. When reading a weather report, precipitation intensities are identified with - and +. Some examples:

- Light Rain: -RA
- Moderate Rain: RA
- Heavy Rain: +RA
- Light Snow: -SN
- Moderate Snow: SN
- Heavy Snow: +SN

4.4 Visibility

Visibility is the distance from which an object can be observed. Visibility can be measured in both a horizontal and vertical manner. A visibility reduction can be caused by fog, mist, haze, smoke, or dust. Fog and mist occur when the air temperature is reduced to or near the dew point. Dew point is the temperature at which air must be cooled to become saturated. Fog is essentially a cloud that is formed at the surface, rather than aloft.

Horizontal visibility is traditionally measured in statute miles (SM). During periods of dense or heavy fog, larger/busier airports have means in measuring visibility in feet known as RVR (Runway Visual Range). Some facilities measure visibility in kilometres (KM) with RVR in metres (M) depending on local procedures.

Vertical visibility is affected by how much of the sky is covered by clouds. It is measured hundreds of feet above ground level (AGL). Various layers of cloud types can exist. The lowest occurrence of a broken or overcast layer is called the ceiling.

IDENTIFIER	CONDITION	SITUATION
SKC / CLR	SKY CLEAR	No clouds
FEW	FEW	1/8 to 2/8 of the sky is covered in clouds
SCT	SCATTERED	3/8 to 4/8 of the sky is covered in clouds
BKN	BROKEN	5/8 to 7/8 of the sky is covered in cloud
OVC	OVERCAST	8/8 of the sky is covered in clouds.
VV	SPECIAL	Caused by non-precipitation conditions like blowing snow or fog

Table 1. Cloud coverage definitions and identifiers for METARS.

4.5 Pressure Settings

Current air pressure affects the altimeter setting of the aircraft. It defines what the lowest usable flight level is. The air pressure is usually expressed in inches (inHG) of mercury in most of the United States and in hectopascals (hPA) in most of the rest of the world. The following is an example for most of the San Juan CERAP, with a transition altitude of 18,000ft MSL. Within the Juliana TMA, procedures change with the transition altitude being much lower at only 5000ft MSL.

ALTIMETER (inHG) (FAA)	LOWEST FL	QNH (hPA) (ICAO)
29.92 or greater	FL180	1013 or greater
29.91 - 29.42	FL185	1012 - 996
29.41 - 28.92	FL190	995 - 979
28.91 - 28.42	FL195	978 - 962
28.41 - 27.92	FL200	961 - 945
27.91 - 27.42	FL205	944 - 929
27.41 - 26.92	FL210	928 - 912

Table 2. Lowest usable flight levels (FL) according to pressure setting.

4.6 METAR

A METAR (METeorological Aerodrome Report) is an observation and provides information about the current weather. It is made up in great part by all of the concepts described above. The information from the METAR, along with other information about the aerodrome, is often broadcast via a dedicated radio frequency called the ATIS (Automatic Terminal Information Service).
Before we continue, we need to review the VATSIM rules for the use of ATIS on the network. Currently, DEL and GND controllers may **NOT** activate an ATIS without a TWR controller or higher online above them, granting authorisation to activate the ATIS.

For example, if you are controlling San Juan Ground (SJU_GND) and no one is covering San Juan Tower (SJU_TWR) or higher, you are not authorised to activate an ATIS.

The reason for this is quite simple: the controller covering TWR always determines and ultimately gets to decide what the active runway in use is. DEL and GND controllers are not allowed to do this. Therefore they can not activate an ATIS on their own.

A METAR is issued normally once per hour, unless significant changes occur prior to the next issuance. It is a snapshot of the airport's weather conditions at the recorded time. A METAR is now normally generated by an automatic system, but some facilities may still use a manually recorded voice report. Here are two examples of METARs and how to decode them.

TJSJ 112356Z 10007KT 10SM FEW025 25/19 A2990

- **TJSJ**
  - This is the airport or station identification.
  - TJSJ is Luiz Munoz Marin International Airport in San Juan, Puerto Rico.
- **112356Z**
  - This is the date and time of the observation.
  - This was taken on the 11th day of the month at 2356 Zulu time.
- **10007KT**
  - This is the wind direction (3 digits) and speed (2 digits) where KT stands for knots.
  - The winds are blowing in from 100 degrees (out of the east) at 7 knots.
  - With gusts of wind, a factor would be added to the end with the letter G: 10007G15KT.
- **10SM**
  - This is the horizontal visibility range.
  - Here it is shown as 10 statute miles.
- **FEW025**
  - This is the vertical visibility with the type of cloud layer.
  - Add two zeros on the end to determine the cloud's altitude above ground level.
  - Here it is shown as a few clouds at 2,500ft.
- **25/19**
  - This is the temperature and dew point in degrees Celsius.
  - If the temperature was negative, the letter M (minus) would be used.
  - For example, M03/M07.
- **A2990**
  - This is the atmospheric pressure or altimeter setting.
  - Here it is measured in inches of mercury at 29.90 inHG.

TNCM 120000Z 06006KT CAVOK 24/17 Q1014 NOSIG

- **TNCM**
  - Princess Juliana Airport in St. Maarten.
- **120000Z**
  - 12th day of the month at 0000 Zulu time.
- **06006KT**

    - Winds are blowing in from 060 degrees (out of the east northeast) at 6 knots.
- **CAVOK**
    - Rather than a visibility cloud layer, shorthand is used: Ceiling And Visibility is OK.
    - There are no clouds below 5,000ft and the horizontal visibility is at least 10 kilometres.
- **24/17**
    - Temperature is 24 degrees and the dew point is 17 degrees Celsius.
- **Q1014**
    - This station reports its atmospheric pressure in hectopascals (hPa).
    - Here the QNH is 1014.
- **NOSIG**
    - This is a trend forecast meaning no significant weather changes are expected in the next two hours.

QUALIFIER		WEATHER PHENOMENA		
INTENSITY OR PROXIMITY	**DESCRIPTOR**	**PRECIPITATION**	**OBSCURATION**	**OTHER**
- Light	**MI** Shallow	**DZ** Drizzle	**BR** Mist	**PO** Well-developed Dust/Sand Whirls
Moderate	**PR** Partial	**RA** Rain	**FG** Fog	**SQ** Squalls
+ Heavy	**BC** Patches	**SN** Snow	**FU** Smoke	**FC** Funnel Cloud Tornado Waterspout
VC In the Vicinity	**DR** Low Drifting	**SG** Snow Grains	**VA** Volcanic Ash	**SS** Sandstorm
	BL Blowing	**IC** Ice Crystals	**DU** Widespread Dust	**SS** Duststorm
	SH Shower(s)	**PL** Ice Pellets	**SA** Sand	
	TS Thunderstorm	**GR** Hail	**PY** Spray	
	FZ Freezing	**GS** Small Hail		
		UP Unknown		

Table 3. METAR Code legend.

5. COMMUNICATION

5.1 Phonetic Alphabet

The phonetic alphabet is the governing phraseology used in real world aviation and also VATSIM. The more familiar you become with this, the quicker you will be able to adjust and learn “aviation speak”.

A - ALPHA	B - BRAVO	C - CHARLIE	D - DELTA	E - ECHO	F - FOXTROT
G - GOLF	H - HOTEL	I - INDA	J - JULIETT	K - KILO	L - LIMA
M - MIKE	N - NOVEMBER	O - OSCAR	P - PAPA	Q - QUEBEC	R - ROMEO
S - SIERRA	T - TANGO	U - UNIFORM	V - VICTOR	W - WHISKEY	X - XRAY
Y - YANKEE	Z - ZULU				

Phonetic numbers are very similar to how normal numbers are spoken with a few minor exceptions to minimise confusion.

0 - ZERO	1 - WUN	2 - TOO	3 - TREE	4 - FO-WAR
5 - FIFE	6 - SIX	7 - SEVEN	8 - ATE	9 - NINER

5.2 Differences between FAA and ICAO Phraseology

Due to the nature of the San Juan CERAP airspace, we use a combination of FAA and ICAO phraseology depending on the location of the traffic. Part of San Juan CERAP is 100% FAA, but the airports within the Juliana TMA and TUPJ use a mix of FAA and ICAO phraseology.

When referring to a runway, two digit runways will have their numbers separated. For example:

- SJU (FAA) runway 10: “Runway One Zero” (not ten).
- TNCM (ICAO) runway 10: “Runway One Zero” (not ten).

When a runway has a single digit, FAA phraseology has no zero at all at the beginning, whereas in ICAO phraseology, they add a zero that must be pronounced. For example:

- SJU (FAA) runway 8: “Runway Eight”.

- TUPJ (ICAO) runway 07: “Runway Zero Seven”.

When referring to an aircraft, the flight numbers can be combined/grouped using FAA phraseology but must be separated into individual digits with ICAO phraseology. For example:

- AAL1328 (FAA): “American Thirteen Twenty-Eight”.
- AAL1328 (ICAO): “American One Three Two Eight”.

Additionally with FAA phraseology, when an aircraft has a maximum takeoff weight (MTOW) of greater than 300,000lbs (B777, A340, etc.) the term “heavy” is placed after their flight number. An aircraft with greater than 1.4 million lbs MTOW (A380, AN-225) uses the term “super”. ICAO phraseology does **NOT** adopt this descriptor. For example:

- DAL87 (B77W) (FAA): “Delta Eighty-Seven Heavy”.
- DAL87 (B77W) (ICAO): “Delta Eight Seven”.

Finally, when talking about a radio frequency, FAA phraseology calls the decimal point in the middle a “point”. Using ICAO phraseology it is called a “decimal”:

- SJU (FAA): “Contact Juliana Approach, One Two Eight **Point** Nine Five”.
- TNCM (ICAO): “Contact Juliana Approach, One Two Eight **Decimal** Nine Five”.

In the real world, many controllers within the Juliana TMA operate using a mix of FAA and ICAO phraseology. Since the differences are minor, both are allowed, with FAA being the primary one.

5.3 Airline Callsigns

This is a list of common airline codes and callsigns, but it is not all encompassing. You are encouraged to do additional internet research for familiarity. Please note that several virtual airlines on VATSIM are fictional. As a result, some identifiers may be duplicated or non-existent except on VATSIM.

ICAO	AIRLINE TELEPHONY	AIRLINE NAME
AAL	AMERICAN	American Airlines
DAL	DELTA	Delta Air Lines
UAL	UNITED	United Airlines
JBU	JETBLUE	JetBlue Airways
BAW	SPEEDBIRD	British Airways
BWA	CARIBBEAN	Caribbean Airlines
KLM	KLM	KLM Royal Dutch Airlines
AFR	AIR FRANCE	Air France
FDX	FEDEX	FedEx Express

Table 4. Common airline callsigns within CERAP airspace.

A tool to find real-world callsigns can be found on
https://www.avcodes.co.uk/airlcodesearch.asp

5.4 Two-way Communication

When contacting an aircraft it is important to indicate which aircraft you are calling and to let them know which controller is calling them by first saying the aircraft callsign, after which you say your controller callsign. For example:

- SJU_GND (FAA) to UAL347: “United Three Forty-Seven, San Juan Ground”.
- TNCM_TWR (ICAO) to N181AB: “November One Eight One Alpha Bravo, Juliana Tower”.

5.5 Controller Coordination

The same type of communication is used when contacting another controller for coordination purposes. This coordination is **REQUIRED** when first staffing or closing a position to an adjacent controller that is active. For example:

- "San Juan Approach, San Juan Ground."
    - Wait for a response.
- "Approach, Ground is ready for a position briefing to open."
    - You will be given all relevant information about aircraft you will be assuming control of.
    - Be sure to ask questions if needed.
    - Approach will then release control to you.
- "You have control, XX."
    - XX is the approach controller's operating initials.
- "My control, YY."
    - YY are your operating initials, found on the controller roster.

6. CLEARANCE DELIVERY

6.1 Direction of Flight

The direction an aircraft is intending on travelling determines the altitude they are required to cruise at.

- IFR Aircraft are separated by 1000ft vertically up to FL410.
- IFR Aircraft are separated by 2000ft vertically past FL410.
- Aircraft north-eastbound need to cruise at an odd flight level (when at or below FL410)
- Aircraft south-westbound need to cruise at an even flight level (when at or below FL400).
- When flying below the transition altitude, change flight level to altitude.
- VFR aircraft use the same system but are offset by 500 feet for separation from IFR aircraft.

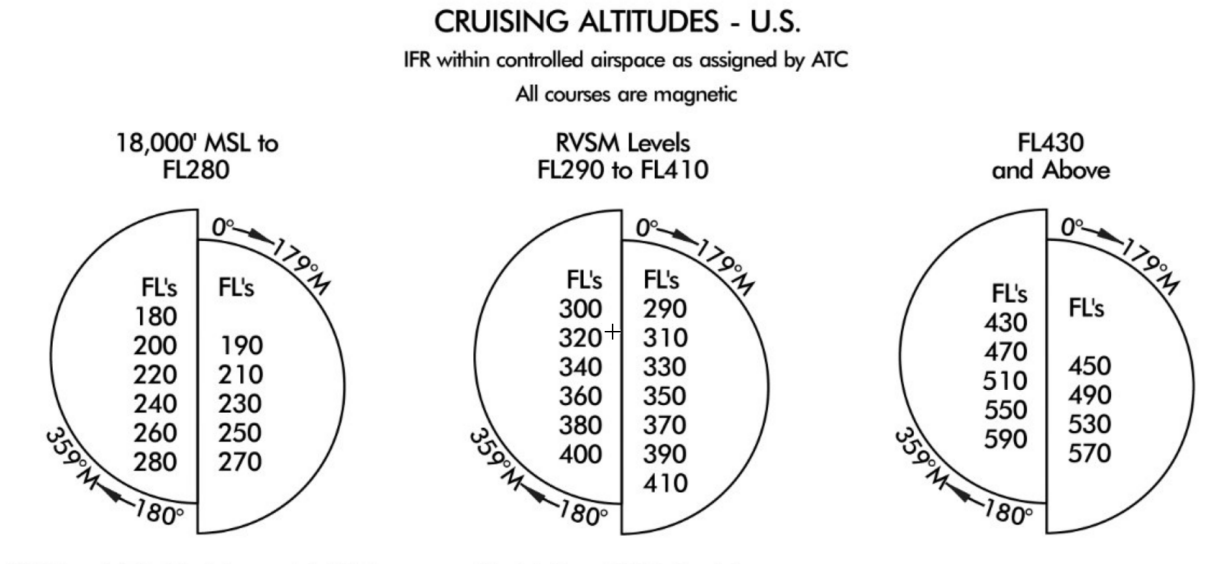

Figure 12. IFR and VFR direction of flight altitudes. (FAA EHUS7, www.skyvector.com)

Filing a wrong flight level is a common error made by pilots. You are responsible to assign them a correct flight level and edit their flight plan accordingly. Use the following as a reminder: “NEODD SWEVEN” (North-East ODD, South-West EVEN).

6.2 RVSM

Reduced Vertical Separation Minima (RVSM) applies to aircraft cruising from FL290 to FL410. It enables them to cruise with just 1000ft of separation. Above FL410, aircraft are no longer in RVSM airspace and the separation increases to 2000ft.

In the real world, not all aircraft are RVSM equipped and will still need 2000ft separation with other aircraft only in their cruise stages. However, on VATSIM, all aircraft that are capable of flying above FL290 are assumed to be RVSM-capable and thus 1000ft of separation is enough.

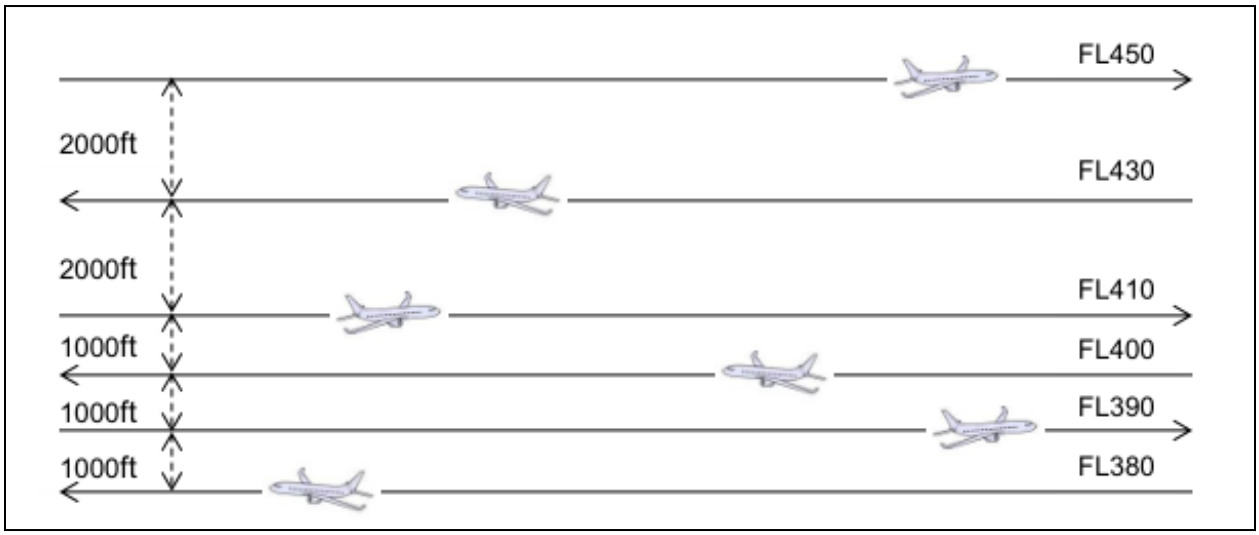

Figure 13. Non-RVSM altitudes for westbound and eastbound flight above FL410.

6.3 Equipment Codes

An equipment code describes the communication, navigation, approach aids and surveillance transponder equipment on board an aircraft. These alphabetic codes are used on FAA and ICAO flight plans to aid controllers in their handling of aircraft.

- On an FAA flight plan, the equipment code is a single character used to represent a radio navigational capability and transponder combination.
- On an ICAO flight plan, multiple letters are used to describe individual radio navigational capabilities and a single letter is used to designate the transponder.
- The FAA began requiring the ICAO format for domestic flights desiring RNAV routes in 2008.
- The ICAO format has already been in use for all domestic flight plans in Canada, Mexico and many other countries for a number of years.

On VATSIM several rules and simplifications have been implemented that make equipment codes virtually useless. These are the following:

- All aircraft filing a flight plan with a cruise altitude at FL290 or above, into RVSM airspace, are deemed RVSM capable regardless of what aircraft they are flying and equipment codes they have filed.
- All aircraft are required to have a transponder with mode C capability on board and use it when in active flight regardless of what aircraft they are flying and equipment codes they have filed. This is made possible through external pilot clients like vPilot which offer a transponder with mode C capability for use on VATSIM regardless of what aircraft you are flying.

6.4 Transponder

A transponder is an electronic device that produces a response when it receives a radio-frequency interrogation. Aircraft have transponders to assist in identifying them on the controller's radar. Controllers use the term "squawk" when they are assigning an aircraft a transponder code. A pilot may be requested to squawk a given code by a controller, via the radio, using a phrase such as :

- "Cessna 123AB, squawk 0363".

The pilot then selects the 0363 code on their transponder and the track on the controller's radar screen will become correctly associated with their identity. When controlling on VATSIM using software like Euroscope, aircraft are correctly associated with their identity automatically even when no squawk code is assigned to an aircraft. Despite that, assigning a squawk code is **always** required for all IFR aircraft. For VFR aircraft it depends on the airport and/or airspace:

- Class Bravo Airspace:
    - VFR: Discrete squawk code is **always** required (not present in San Juan CERAP).
- Class Charlie Airspace:
    - VFR: Discrete squawk code is **often** required.
- Class Delta Airspace:
    - VFR: Discrete squawk code is **not** required (on request for flight following).
- Class Echo Airspace:
    - VFR: Discrete squawk code is **not** required (on request for flight following).

Some codes can be selected by the pilot if and when the situation requires or allows it, without permission from air traffic control. Other codes are generally assigned by the controller. For

flights on instrument flight rules (IFR), the squawk code is typically assigned as part of the departure clearance and stays the same throughout the flight.

Flights on visual flight rules (VFR), when in uncontrolled airspace, will "squawk VFR" (1200 in the US and Canada, 7000 in Europe). Upon contact with a controller, they will be told to squawk a certain unique or discrete code. When changing frequency, for instance because the VFR flight leaves controlled airspace or changes to another ATC unit, the VFR flight will be told to "squawk VFR" again.

In order to avoid confusion over assigned squawk codes, controllers will typically be allocated blocks of squawk codes, not overlapping with the blocks of nearby controllers, to assign at their discretion.

The numbers used in a squawk code range from 0 to 7. The numbers 8 and 9 can **not** be used.

6.5 Departure Procedures

Departure procedures describe to pilots in a pictorial and textual manner guidelines on initial climb, headings, or tracks to follow. Departure procedures can be divided into:

- Obstacle Departure Procedures (ODP)
- Standard Instrument Departures (SID)

SIDs can further be divided into three categories:

- Pilot-nav
    - A pilot-nav SID is a SID where the pilot is primarily responsible for navigation along the SID route.
    - It allows for the aircraft to get from the runway to its assigned route with no vectoring required from air traffic control.
    - They are established for airports where terrain and related safety factors dictate a specific ground track be flown.

- Radar vector
    - A radar vector SID is used where air traffic control provides radar navigational guidance to a filed or assigned route or to a fix depicted on a SID.
    - Flying a vector SID may require first flying an obstacle departure procedure (ODP).
    - This is usually annotated in the ODP section stating, "Fly runway heading to (xxx altitude) prior to making any turns." This ensures the aircraft is clear of any obstacles.

    - Vector SIDs give air traffic control more control over air traffic routing than do pilot-nav SIDs.

- Hybrid
    - A hybrid SID is a departure that combines elements of both the pilot-nav and radar vector departures.
    - A hybrid SID usually requires the pilot to fly a set of instructions, then be vectored to a defined route to a transition to leave the terminal area.

6.6 IFR Clearance

IFR aircraft can file a route using a number of different methods. For the purpose of simulation, we will focus on Radar vector departures and Standard Instrument Departures. We will also explore some different verbiages between FAA and ICAO.

For an **FAA IFR clearance**, think of the acronym **CRAFT**:

- **Clearance Limit**
    - Their destination.
- **Routing**
    - The departure procedure and airways to their destination.
    - Be sure to reference any local SOPs and LOAs for restrictions or preferred routes.
- **Altitude**
    - Initial altitude and final cruise flight level.
- **Frequency**
    - Departure control frequency.
- **Transponde**r
    - Discrete squawk code.

The following is an example of AAL123 out of San Juan (SJU) on a SID using FAA verbiage:

- American 123,
- Cleared to Miami International Airport via ACONY 3 Departure, SAPPO Transition, then as filed,
- Maintain 5000,
- Expect Flight Level 360 in one zero (10) minutes after departure,
- Departure frequency 119.4,
- Squawk 1234.

Make sure the pilot always reads back the full clearance correctly.

- American 123, readback correct.

If they make a mistake, repeat the part they got wrong and make them read back that part again.

- American 123, negative, Climb and maintain 5000.

An **ICAO IFR clearance** is a bit shorter and usually does **NOT** contain the final cruise altitude and departure control frequency:

- **Clearance Limit**
  - Their destination.
- **Routing**
  - The departure procedure and airways to their destination.
  - Be sure to reference any local SOPs and LOAs for restrictions.
- **Altitude**
  - Initial climb altitude or flight level.
- **Transponde**r
  - Discrete squawk code.

The following is an example of KLM456 out of St. Maarten (TNCM) on Vectors using ICAO verbiage:

- KLM 456,
- Cleared to Amsterdam, via radar vectors to MNOLO, then flight planned route,
- Initial Climb Flight Level 150,
- Squawk 1234.

FAA	ICAO
As filed	Flight planned route
Climb and maintain [initial altitude / flight level]	Initial climb [initial altitude / flight level]
Expect [cruise level] 10 minutes after departure	-
Departure frequency [frequency]	-
[frequency first 3 digits] Point [remaining digits]	[frequency first 3 digits] Decimal [remaining digits]

Table 5. Differences between FAA and ICAO IFR clearance structure and phraseology.

6.7 VFR Clearance

Unlike IFR aircraft, VFR aircraft are not always required to file a flight plan on VATSIM. It is still recommended they do. Some airports always require a flight plan even for VFR depending on the airspace and local procedures.

FAA Airports **do not require** filing a VFR flight plan. ICAO Airports **require** a VFR flight plan to be filed.

The following is an example of a generic **VFR Clearance:**

- N238BV,
- Maintain VFR at or below 2,000, (FAA only. Instructions received from Tower for ICAO)
- Squawk 3415, (if requesting flight following or if local procedures require it)

Make sure the pilot always reads back the full clearance correctly.

- Altimeter 29.92 / QNH 1013, (FAA / ICAO)
- ATIS Bravo is current, (if applicable)
- Advise when ready to taxi.

A **VFR Clearance** doing local pattern work does not need a discrete squawk code since the aircraft is staying with Tower and does not require radar identification:

- N83SF,
- Altimeter 29.92 / QNH 1013, (FAA / ICAO)
- ATIS Bravo is current, (if applicable)
- Advise when ready to taxi.

6.8 Special Visual Flight Rules

SVFR is a procedure to allow VFR aircraft to fly into or out of an airport when the weather is below the minima for the defined airspace with the help of charted routes, landmarks, or other visual cues. The FAA has put several limits on SVFR operations:

- Only within the lateral boundaries of Class B, C, D, and E surface areas.
- Only below 10,000ft MSL.
- Only when requested by the pilot.
- On the basis of weather conditions reported at the airport of intended landing/departure.

The following is an example of a Special VFR clearance for an aircraft departing San Juan (SJU):

- N238BV maintain Special VFR at or below 2,000ft.

SVFR aircraft are not assigned fixed altitudes to maintain because of the clearance from clouds requirement.

When the ground visibility at the airport of intended landing/departing is below 1 mile, a clearance cannot be issued, unless an emergency exists. Request the pilot's intentions for what he wants to do next.

- "San Juan Visibility less than 1 mile. ATC unable to issue departure clearance. Advise Intentions."

7. GROUND OPERATIONS

7.1 Responsibilities

The Ground controller is responsible for all the movement areas (excluding active runways) on the airport surface area. The Ground controller's main responsibility is to safely and efficiently move aircraft to/from the ramps, gates, aprons, and runways by providing sequencing, taxi instructions, or a progressive taxi instructions when necessary.

7.2 Airport Layouts

Airports are generally divided into movement and non-movement areas. A non-movement area is **NOT** under ground control's jurisdiction. If a pilot calls for start and pushback in a non-movement area, you can respond with:

- "Push and start at your discretion. Advise when ready to taxi."

If an aircraft requires pushback on to an active taxiway (or movement area), this will require a clearance from ground control.

- "JetBlue 712 push approved on taxiway Hotel. Face west. Advise when ready for taxi."

This is the airport diagram for San Juan (SJU). The light grey areas are non-movement areas; the ramps, aprons, and gates. The areas in blue are movement areas; those that are under ground control. The solid black lines are the runways which are owned by Tower/Local controller.

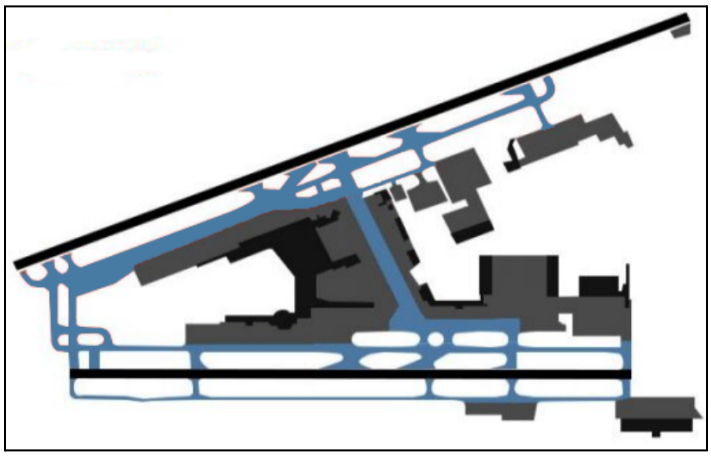

Figure 14. TJSJ (SJU) ground diagram. Movement areas in blue, non-movement areas in gray.

7.3 Ground Movement

All fixed wing aircraft will taxi along published taxiways to and from the active runways. You must provide the proper taxi route for the aircraft to use. Sometimes, aircraft will be required to "hold short" or stop before an assigned taxiway or runway. Pilots **MUST** always readback hold short instructions.

- "United 346 Heavy, Runway 8. Taxi via Hotel, Alpha, Sierra."
- "Windward 2617, Runway 10. Taxi to holding point Alpha via Bravo, Alpha."
- "N392CP taxi to Apron 9 via Hotel, Hotel 7. Hold short of Runway 10."

In addition there are several ways to expedite traffic flows like "follow". When issuing following instructions, be sure to include as much information as possible in order to prevent confusion. Details such as the type of aircraft, livery and location should be provided. When both aircraft are from the same airline you can refer to it as "company".

- "American 432, follow the United Airlines Boeing 737 at your 12 o'clock."
- "KLM 765, follow the company Boeing 787 at your 3 o'clock."

Another directive is "give way". This directive is provided to an aircraft waiting on another before taking action. Be sure to provide information to the other aircraft to prevent confusion.

- "JetBlue 561, at Sierra give way to the American Airlines Airbus A320 coming from the left ."

7.4 Progressive Taxi

Progressive Taxi is a step by step set of taxi instructions for a pilot to get them from one point to another. These are typically requested by pilots unfamiliar with the area. It may also be deemed necessary by ATC due to construction or weather. Standard taxi phraseology is used to issue progressive taxi instructions.

- "N935GU taxi to Signature via Bravo."
- "Turn right onto Echo"
- "Turn right onto Sierra"
- "Make the second left turn onto Sierra 2 into the ramp."

7.5 Ground Movement (Rotary Aircraft)

Helicopter taxi instructions can vary significantly from fixed wing aircraft because of their ability to complete Vertical Takeoffs and Landing (VTOL). If equipped with wheels, a helicopter can be

given normal taxi instructions to a runway or parking spot just like a fixed wing aircraft. A hover taxi is accomplished a few feet above the ground at a speed of 20 knots or less, but is similar to a normal taxi.

- "Helicopter N294CC, taxi to Helipad 2 via Sierra 2, Sierra."

An air taxi is used for expeditious taxi at 100 feet off the ground.

- "Helicopter N294CC, air taxi direct to Helipad 2."

Be sure to issue caution advisories when necessary.

7.6 Aircraft Categories

For the purposes of ground operations, you should observe for basic weight categories of aircraft.

CATEGORY (FAA/ICAO)	AIRCRAFT
Light	C172, C208, PA-28, C310, PA-44, BE-350, TBM-9, etc.
Large/Medium	ERJ, CRJ, MD80, B737, A320, B757, etc.
Heavy	A330, A340, A350, B747, B767, B777, B787, etc.
Super	A380, AN225

Table 6. Aircraft categories for the purposes of ground operations.

7.7 Coordination

- Controllers must coordinate all runway crossings.
    - Blanket releases are possible with the Tower/Local controller's approval.
    - A blanket release means you are able to cross active runways without asking Tower/Local for approval.
    - This should be coordinated at the start of your control session.
- Verify aircraft are squawking the assigned code.
    - This does **NOT** mean you should ask the aircraft to squawk Mode C, you do not have radar capability after all.
- When asking an aircraft to do something quickly, use one of the following phrases:
    - "Without delay".
    - "Expedite".

8. TOWER OPERATIONS

8.1 Responsibilities

The Tower controller is responsible for all the (active) runways and managing the aircraft in the airspace directly surrounding the airport. Tower at San Juan CERAP does **NOT** provide radar services.

8.2 Runway Selection

Local Standard Operating Procedures (SOPs) will define the variables for runway selection for the various airports in San Juan CERAP. Aircraft takeoff and land into the wind. This means that generally the runway selection will typically be the runway which most aligns with the wind. Within San Juan CERAP and most of the Caribbean, winds prevail mainly from the east.

8.3 ATIS

The Automated Terminal Information Service (ATIS) is a continuous broadcast of a recorded message that provides a fully decoded METAR to pilots which is automatically updated at fixed intervals. On the VATSIM network, we use a program called vATIS. Each updated iteration of an ATIS is identified by a letter. This letter should not be shared by nearby fields to avoid confusion.

You **MUST** inform all aircraft of frequency when the ATIS information has been updated!

- “Attention all aircraft this frequency. [Airport] information [Letter] is current. [Altimeter setting], [Wind condition].
- “Attention all aircraft this frequency. San Juan Airport information Bravo is current. Altimeter 3010, Winds 080 at 14.

8.4 Takeoff Clearance

One of your primary responsibilities as a tower controller is to issue takeoff clearances to aircraft. This often includes additional instructions as well.

- American 1334, winds 060 at 10. Runway 8, cleared for takeoff.
- N2894T, make a left downwind departure. Winds calm. Runway 9, cleared for takeoff.
- JetBlue 212, caution wake turbulence from previously departing B757. Winds 090 at 8. Runway 10, cleared for takeoff.

- KLM 223, after departure right turn heading 180. Winds 110 at 15. Runway 10, cleared for takeoff.

8.5 Line Up And Wait

At times it may be beneficial or necessary to have an aircraft taxi into takeoff position, but not yet commence the takeoff roll. This is known as Line Up And Wait procedures. This can be needed for wake turbulence delays, in-trail spacing requirements, traffic on the runway downfield, coordination, etc. As a courtesy, you should advise the purpose or reason for the Line Up And Wait.

- “Execjet 210, Runway 8, line up and wait. Traffic will cross down field.”
- “United 455 Heavy, Runway 10, line up and wait. Short delay for departure spacing over ACONY.”
- “American 123, Runway 10, line up and wait. Traffic backtracking the runway.”

When an aircraft is authorised to line up and wait, inform it of the closest traffic within 6-flying miles requesting a full-stop, touch-and-go, stop-and-go, option, or unrestricted low approach to the same runway.

- “KLM 223, Runway 10, line up and wait. Traffic is a Boeing 737, 5 miles final.”

An aircraft should not be in Line Up and Wait status for more than 90 seconds without further instructions.

8.6 Intersection Takeoffs

A pilot may request to depart from a runway intersection rather than full length. This can speed up the flow of traffic significantly, especially when dealing with light aircraft that don’t need full length. If so, the intersection name and available takeoff distance remaining must be included in the takeoff clearance.

- “Winair 314, winds calm. Runway 8 at Sierra 3, cleared for takeoff. 6,950 feet remaining.”

8.7 Takeoff Cancellation

At times, it may become necessary to cancel an aircraft’s takeoff clearance. When this occurs you **MUST** include a reason.

- “Delta 6512, cancel takeoff clearance. Unauthorised traffic on the runway.”

8.8 Landing Clearance

Another of your primary responsibilities as a tower controller is to issue landing clearances to aircraft. These could also include additional information as well.

- “Spirit Wings 993, winds 060 at 12. Runway 10, cleared to land.”
- “N7237W, winds calm. Runway 9, cleared to land. Expect a right turn off to vacate the runway.”
- “Silver Wings 424, winds 090 at 8. Runway 10, cleared to land. Caution wake turbulence from previous arrival, B777.”

8.9 Land And Hold Short Operations

Land and Hold Short Operations (LAHSO) is a landing clearance with a directive to land and stop (or exit) prior to reaching a specified point on the runway. This operation is used to ensure that multiple runways can be used simultaneously while still maintaining positive separation and is primarily used in the United States. Many US airports will publish common LAHSO points and landing distances available. Although LAHSO are not in use at San Juan CERAP since San Juan CERAP does not have crossing runways, this is a standard procedure all tower controllers should be aware of.

- “Bluestreak 565, winds 210 at 15. Runway 27, cleared to land. Hold short of Runway 22L for departing traffic.”

8.10 Same Runway Separation

Same Runway Separation (SRS) is not to be confused with wake turbulence separation minima. SRS is an FAA specific procedure and can only be used at FAA operated airports. It can **NOT** be used at airports within the Juliana TMA and TUPJ.

SRS is based on three aircraft categories:

- CATEGORY I
    - Small aircraft weighing 12,500 lbs. or less, with a single propeller driven engine, and all helicopters.
- CATEGORY II
    - Small aircraft weighing 12,500 lbs. or less, with propeller driven twin-engines.
- CATEGORY III
    - All other aircraft.

Separate a departing aircraft from a preceding departing or arriving aircraft using the same runway by ensuring that it does not begin takeoff roll until the other aircraft has departed and crossed the runway end or turned to avert any conflict. If you can determine distances by reference to suitable landmarks, the other aircraft needs only be airborne if the following minimum distance exists between aircraft:

1. When only Category I aircraft are involved- 3,000 feet.
2. When a Category I aircraft is preceded by a Category II aircraft- 3,000 feet.
3. When either the succeeding or both are Category II aircraft- 4,500 feet.
4. When either is a Category III aircraft- 6,000 feet.
5. When the succeeding aircraft is a helicopter, visual separation may be applied in lieu of using distance minima.

8.11 Wake Turbulence

Wake turbulence is created by all aircraft. An aircraft's wake is worst when it is heavy and slow. Therefore, during takeoff and landing, where the tower controller handles the most aircraft, is a critical phase, especially with Heavy and Super aircraft.

Wake turbulence is worst during calm wind conditions. The presence of wind helps to break up any wake turbulence currents.
In an ICAO flight plan, the Wake Turbulence Category indicator follows the aircraft type designator:

- A388/S
- B744/H
- A320/M
- C172/L

It is based on the maximum certificated take-off weight, as follows:

- SUPER (J) - Airbus A-380-800 (A388) and Antonov An-225 (A225).
- Heavy (H) - Aircraft types of 300,000 pounds or more, except for those listed as SUPER (J).
- Medium (M) - Aircraft types less than 300,000 pounds and more than 15,400 pounds.
- Light (L) - Aircraft types of 15,400 pounds or less.

The following separation minima should be applied to aircraft based on time:

Lead / Trail	Light (L)	Medium (M)	Heavy (H)	Super (J)
Super (J)	3 min	3 min	3 min	-
Heavy (H)	2 min	2 min	-	-
Medium (M)	2 min	-	-	-
Light (L)	-	-	-	-

Table 7. Wake turbulence separation minima for departures.

When the succeeding aircraft (trailing) is departing from a runway intersection behind a:

- Heavy - 3 minutes
- Super - 4 minutes

Add one minute if a departure will follow a low or missed approach. Add the following to your takeoff clearance:

- “Caution wake turbulence, [Heavy/Super][Aircraft Type]”

8.12 Go-Arounds

Go-around can happen for a number of reasons, but most commonly because of the loss of positive same-runways-separation, runway incursions, or pilot induced missed approaches. On VATSIM, it is common for pilots to take longer than expected to exit the runway, or to have someone spawn on the runway. In general, it is good practice to issue go-arounds before an aircraft reaches the minimums for the approach.

You may **ONLY** assign a published missed approach if the aircraft was assigned to an instrument or charted visual approach. If the aircraft was given an uncharted visual approach clearance, missed approach instructions must be given. Stating a reason for an ATC directed go-around is common courtesy if not obvious.

- “[Callsign] go around. Execute the published missed approach. Traffic on the runway.”
- “[Callsign] go around. Fly [Heading], climb and maintain [Altitude].”

8.13 Runway Change

At times when an aircraft is on final, you may need to switch their runway for landing, after they have already been cleared for an approach. This is most common with parallel runways, but can be used at San Juan (SJU) as well. This manoeuvre can be used for traffic congestion relief or a runway emergency.

For example when an aircraft is inbound on a visual approach for runway 10 at San Juan (SJU):

- “JetBlue 316, change to Runway 8. Runway 8 cleared to land. Wind 060 at 12.”

8.14 Circle To Land

At times, due to weather factors or pilot requests, you may be required to clear an aircraft for an approach to one runway and land on another. This could be used to land on a completely different runway, or the same runway but from the opposite direction.

- “[Callsign] circle [Direction] for [Pattern]. [Runway] cleared to land.”

For example when an aircraft is inbound on ILS runway 10 at San Juan (SJU)

- “Jet Speed 99, circle south for a left downwind. Runway 28 cleared to land.”

8.15 VFR Takeoff Clearance

The takeoff clearance of VFR traffic is dependent on two major factors:

- Is the aircraft remaining in the VFR pattern, or
- Is the aircraft departing the local area (to another airport, or possibly to go practice and eventually return to the home airport.)

Phraseology will differ in some locations but here are common examples:

- “N6263D, make left closed traffic. Winds 120 at 10. Runway 8 cleared for takeoff.”
- “N2854T, proceed on course. Runway 9 cleared for takeoff.”
- “N356DC, right downwind departure approved. Runway 10 cleared for takeoff.”

8.16 VFR Landing Clearance

Landing clearances for VFR traffic that are going to make a full stop are identical to IFR landing clearances. A full stop landing is when an aircraft intends to land and vacate the runway.

- “N511SV, wind calm. Runway 10 cleared to land.”

In addition to full stop landings, VFR aircraft may also request one of the following alternatives:

- Make a low approach
- Complete a touch and go
- Complete a stop and go
- Make a full stop landing

A tower controller may specifically clear an aircraft for any one of these, or clear them for the option, which allows the pilot to choose one of the options for himself.

- “N44CS, cleared for touch and go Runway 07.”
- “N783KS, cleared for the option Runway 07.”

At times, likely due to traffic congestion, you may have to deny a request.

- “N313TX, unable touch and go. Cleared for low approach Runway 10.”

It is important to know and understand the differences between the various options:

- Low Approach
    - Aircraft is authorized to overfly the runway, but not make contact with it.
- Touch and Go
    - Aircraft is authorized to land (wheels down) then reapply takeoff power to begin another takeoff.
- Stop and Go
    - Aircraft is authorized to land and come to a complete stop on the runway.
    - Then reapply takeoff power to begin another takeoff with the remaining runway distance (most commonly done at night).

It is important to ensure you give climb out instructions for aircraft completing any of these options.

- "N1214T, after touch and go, make left closed traffic."

8.17 VFR Pattern

VFR aircraft will usually conduct pattern operations at 500 ft AGL (Above Ground Level) for helicopters, 1,000 ft AGL for propeller aircraft, and 1,500 ft AGL for jet aircraft. The standard pattern is left.

Be sure to reference local SOPs, for sometimes because of terrain, obstacles, or population densities, traffic pattern direction (left or right) and altitudes can be airport specific.

Remember, although VATSIM ATC clients allow us to see all targets for simulation purposes, you have **NO** radar capabilities. Therefore you are **UNABLE** to provide any radar separation for VFR aircraft as a tower controller.

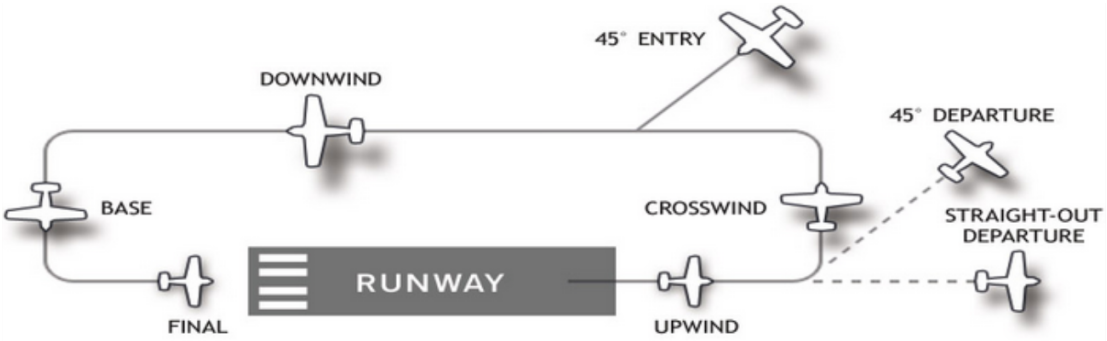

Figure 16. The VFR Traffic Pattern visualized.

The VFR pattern is made up out of several legs:

- Upwind
    - The upwind leg is represented by the portion from which the aircraft departs the runway and extends along the runway centerline.
    - The upwind leg may be extended by ATC when necessary.
    - The upwind leg is a standard leg to depart from the pattern.
- Crosswind
    - The crosswind leg is perpendicular to the runway and its direction will be dictated by ATC in the takeoff clearance.
    - The crosswind leg may be extended by ATC when necessary.
    - The crosswind leg is a standard leg to depart from the pattern.
- Downwind
    - The downwind leg is parallel to the runway in the opposite direction.
    - The downwind leg may be extended by ATC when necessary.
    - The downwind leg is a standard leg to enter the pattern.
- Base
    - The base leg is perpendicular to the runway in the opposite direction from the crosswind leg.
    - The base leg may **NOT** be extended by ATC.
    - The base leg is a standard leg for entry into the pattern.
- Final
    - The final leg is in line with the runway.
    - The final leg is a standard leg for entry into the pattern.

8.18 VFR Sequencing

VFR traffic may be sequenced using a number of different techniques:

- Extending a pattern leg
- S-Turns
- 270/360 degree turns
- Follow traffic
- Visual holds
- Speed restrictions

Upwind, crosswind, and downwind legs may be extended by ATC when necessary. In an effort to help sequence aircraft in/out of the pattern or with inbound/outbound IFR traffic, you can use the following phraseology:

- “[Callsign], extend your [Leg], I will call your [Leg].”

- “N714ZF, extend your downwind. I will call your base leg.”

Then once they have extended their current leg enough and can turn to the next:

- “[Callsign], turn [Leg] now.”
- “N714ZF, turn base now.”

Aircraft can be instructed to make one or more S-Turns, which create a longer flying distance for the aircraft, creating space. This is among the shortest sequencing techniques. When commanding an S-Turns, provide the pilot with a direction to make the turn and how many if required.

- “[Callsign], make [Count], [Direction], S-Turns.”
- “N67924, make two right S-Turns.”
- “N6409H, make one S-Turn left.”

Aircraft can be instructed to make a left or right 270 degree or 360 degree turn depending on relative location. Similar to S-Turns, you can specify the number of turns to make. This operation takes time and should be limited in order to prevent confusion or disorientation to pilots. Also realise that when a pilot completes a standard rate turn at 3 degrees per second, a 360 degree turn should take 2 minutes.

- “[Callsign], make [Count] [Direction] [Degrees] turn(s).”
- “N67924, make one right 360 turn and rejoin downwind.”
- “N6409H, make a left 270 turn to enter base leg.”

VFR aircraft can also be instructed to follow another aircraft. This is typically used when you have multiple aircraft in the pattern. It helps to expedite the traffic flow while maintaining separation. You **MUST** advise the second aircraft of the traffic ahead, and verify they have them in sight, before giving the direction to follow.

- “[Callsign], follow the [Description] [Position].”
- “N12878, follow the green Cessna Skyhawk on the downwind.”
- “N613JG, follow the regional jet on a 2 mile final.”

ATC can instruct aircraft to hold over a visual point such as a major landmark, lake, water tower, shopping center, etc. These points are often shown on VFR charts and sometimes used as mandatory reporting points as well. Due to the large variety in scenery files for pilots, this is an uncommon procedure on the VATSIM network.

- “[Callsign], hold visually over [Position].”
- “N363EF, hold visually over the Loiza Dam.”

ATC has the ability to instruct aircraft to maintain a specific speed. Due to aircraft limitations and simulator differences, this is not commonly used for sequencing VFR aircraft.

- "[Callsign], maintain [Speed]."
- "N311HE, maintain 90 knots."

8.19 Helicopter Operations

Unlike fixed wing aircraft, helicopters have the ability to takeoff and land from locations on the airfield other than runways. No matter where the helicopter is departing from, you are responsible for issuing all takeoff and landing clearances while maintaining safety.

When doing so, some things to remember are:

- Can I see the helicopter?
- Are there any hazards to the helicopter?

When issuing a takeoff clearance, the following phraseology should be used:

- "Helicopter [Callsign], [Location], [Direction], [Other], Cleared for takeoff."

[Other] may be a reference to avoiding hazards like other traffic, vehicles, power lines, etc. It can also be instructions to turn a specific direction or remain clear of a location. It can also represent caution advisories like wake turbulence.

- "Helicopter N181BA, from Ramp 4 south departure. Remain south of Runway 8, cleared for takeoff. B737 on 4 mile final for Runway 10."

What if you can't see the helicopter or a situation poses a risk to the helicopter? Departure is still possible, however the following phraseology should be used:

- "Helicopter [Callsign], departure from [Location] will be at your own risk, [Other], cleared for takeoff."
- "Helicopter N181BA, departure from Helipad 1 will be at your own risk. Remain north of Runway 9. Cleared for takeoff."

This clearance is most common when the helicopter is departing from a location hidden by a building or a position outside the airport boundary (common for heliports).

Helicopters are authorised to conduct simultaneous takeoffs and landings provided at least 200 feet of separation exist between each helicopter, and their courses maintain that minimum distance on departure. You can safely accomplish this by advising the helicopters to:

- “Maintain visual separation of at least 200 feet.”

Maintaining visual separation by itself is **NOT** enough of a clearance for this operation type. The 200 foot distance **MUST** be stated in your instructions.

Landing clearance is much the same as a takeoff clearance. The following phraseology should be used:

- “Helicopter [Callsign], [Approach], [Direction] for [Location], [Other], Cleared to land.”
- “Helicopter N181BA, make straight in for Helipad 2. Remain in between Runways 8 and 10. Cleared to land.”

Instructions to make left or right turns in a particular direction may be used if needed. Best practice is to advise the helicopter where you want them to go and what you don’t want them to do.

What if I can’t see the helicopter or a situation may pose a risk to the helicopter? Landings are still possible however the following phraseology should be used:

- “Helicopter [Callsign], Landing at [Location] will be at your own risk. [Other], Cleared to land. Report landing assured.”
- “Helicopter N181BA, landing at Helipad 1 will be at your own risk. Cleared to land. Report landing assured.”

Report landing assured is used to have the helicopter report when they have safely touched down. Remember this is when you can’t see the helicopter and confirmation of a safe landing needs to be reported to ATC.