Virtual Air Traffic Simulation
Caribbean Division

VATCAR
BASIC ATC STUDY GUIDE

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This study guide is a revised version of the VATUSA Basic ATC Study Guide edited with permission to reflect procedures and policies applicable to VATCAR, many thanks to VATUSA Management for allowing us to use their study guides as the base to build our own study guides.

This material is not for real-world training

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FOREWORD

Welcome to the beginning of the VATCAR study guides and training program.
In providing the training and knowledge for your growth as an air traffic controller, every attempt has been made to make this as real as it gets and as fun as it gets. You can

progress and learn at your pace and use these guides not only for testing purposes, but as a tool for continuous review.

VATCAR is a division of VATSIM, which is the world wide governing body that sets general policies and guidelines for our enjoyment in this wonderful hobby. We are one of several divisions of VATSIM, with our responsibility being for the Caribbean region, hence the 'CAR' in VATCAR. As you learn and work with us, you will quickly realize that we are all from different backgrounds, nationalities, cultures etc., and this makes us quite unique.

Training is always a work in progress and we are very lucky and pleased to have a hard working and dedicated training staff.

Good luck on your venture into ATC, and remember questions make us stronger and better, not weaker.

Bill Raymond
VATCAR Director

INTRODUCTION
The VATCAR Basic ATC Study Guide contains the necessary information for controllers to familiarize themselves with the basic operations of virtual Air Traffic Control. It was written using both the United States FAA and ICAO operating procedures as sources.

CHAPTER 10 - THE AIR TRAFFIC CONTROL MISSION
1-1. Air traffic control is a service provided to promote the safe, orderly, and expeditious flow of air traffic. The primary purpose of the ATC system is to prevent a collision between aircraft operating in the system and to organize and expedite the flow of traffic. In addition to its primary function, the ATC system has the capability to provide (with certain limitations) additional services. The ability to provide additional services is limited by many factors, such as the volume of traffic, frequency congestion, quality of radar, controller workload, higher priority duties, and the pure physical inability to scan and detect those situations that fall in this category. It is recognized that these services cannot be provided in cases in which the provision of services is precluded by the above factors. Consistent with the aforementioned conditions, controllers shall provide additional service procedures to the extent permitted by higher priority duties and other circumstances. The provision of additional services is not optional on the part of the controller, but rather is required when the work situation permits.

CHAPTER 2 - CONTROLLER FUNCTIONS
2-1. There are three basic types of ATC facilities: Control Towers, Approach Controls, and Air Route Traffic Control Centers. Within each facility there are individual operating positions. Here is a basic summary of where each position is and what it does:

2-2. Clearance Delivery (DEL) - Located in the Control Tower, Clearance Delivery is often combined with Ground Control. It issues IFR clearances and general advisories.

2-3. Ground Controller (GND) - Located in the Control Tower, Ground exercises control over taxiing aircraft and vehicles. It issues departure information, weather conditions, and airport advisories. Ground also maintains a general surveillance of the airport including taxiways and inactive runways.

2-4. Local Controller (TWR) - Also located in the Control Tower, Local is in control of all arriving, departing, and enroute aircraft on the runways, in the VFR traffic patterns, and in the Class D airspace. It maintains a constant visual surveillance of the airport and surrounding airspace. Local Control normally selects the runway in use.

2-5. Approach Controller (APP) - The primary position located in the Approach Control, it controls all IFR aircraft within its portion of the Approach Control's delegated airspace. This airspace will include the primary airport and may include other satellite airports. Approach provides vectors to the airport and issues approach clearances. Very busy Approach Controls may be divided into multiple positions (sectors) such as Departure, Arrival, East Approach, West Approach, etc. Each sector is responsible for a piece of the Approach Control's overall airspace. When a sector's airspace includes Class B or C airspace, the position also controls any VFR aircraft in the area.

2-6. Departure Controller (DEP) - Another position located in the Approach Control, Departure also controls all IFR aircraft within its portion of the Approach Control's delegated airspace. While this portion is primarily the airspace used by aircraft departing the primary airport, Departure may also have satellite airports within its airspace and it would perform the Approach Controller function for those airports.

2-7. Center Controller (CTR) - Located in the FIR/ARTCC, the Center Controller provides ATC services to aircraft operating on IFR flight plans within controlled airspace principally during the enroute phase of flight. Like Approach Controls, FIR/ARTCCs may also be broken up into smaller sectors with each sector being responsible for its piece of the overall FIR/ARTCC airspace.

2-8. Flight Service Stations (FSS) - These are not true air traffic control facilities in that they do not provide air traffic control service directly to aircraft. They do however offer a myriad of services such as maintaining flight plans, conducting pilot briefings, relaying clearances, and broadcasting weather. At selected locations, FSSs also provide En Route Flight Advisory Services (Flight Watch) to VFR aircraft.

2-9. In the real-world there are limits placed on what positions may perform what functions. In the ASRC world there is an unofficial hierarchy that states if the position that normally does a function isn't open, the job goes to the next higher one. So if GND isn't open but TWR is, TWR does GND's job. And so on up the chain. However, this is not a hard and fast rule. If you find that doing everything everywhere is more than you

can handle, don't do it. You're not obligated to do anything except what you signed on for (DEL, GND, TWR, APP, or CTR).

CHAPTER 3 - WEATHER INFORMATION

3-1. Before we get into decoding a weather report there are a few things you should know about weather.

3-1-1. All sky conditions are reported in feet Above Ground Level (AGL). Only Broken or Overcast cloud layers constitute a ceiling.

3-1-2. In order for a pilot to fly under Visual Flight Rules (VFR) in Class B, C, or D Airspace the reported ceiling must be at or above 1000 (AGL) and the visibility at or above 3 SM. Anything less than that and the pilot must get an Instrument Flight Rules (IFR) or Special VFR clearance from ATC.

3-1-3. Not all elements of a weather report are modeled by FS. For the purposes of ASRC/SB there isn't much point in worrying about these items. It's nice to know how to decode them but they will have no impact on your controlling.

3-1-4. You should review the weather report(s) for the airport(s) within your airspace as soon as you log on and periodically check for any changes while you are working.

3-1-5. When issuing clearances or weather information, and the winds are less than three knots, you can say the winds are Calm.

3-2. METAR is the international standard Aviation Routine Weather Report. Certain elements of a METAR report are different from country to country. For this section we will deal with METAR as used in the United States.

3-3. A sample METAR is decoded below:

METAR KABC 121755Z AUTO 21016G24KT 180V240 1SM R11/P6000FT -RA BR BKN015 0VC025 06/04 A2990 RMK A02 PK WND 20032/25 SLP125

a) **METAR** - TYPE OF REPORT - Either routine (METAR) or special (SPECI)

b) **KABC** - ICAO IDENTIFIER - Four letter ICAO Airport Code

c) **121755Z** - DATE and TIME - First two digits are the date followed by the hour and minutes in UTC.

d) **AUTO** - MODIFIER - None for a manual report, AUTO for an automated report, and COR for a corrected report.

e) **21016G24KT 180V240** - WINDS - Normally a 5-digit grouping (6-digits if speed is over 99 knots). The first 3-digits is the direction, the next two or three is the speed. G indicates gusts with the highest gust report after it. V indicates variable wind direction. VRB indicates variable wind speed 6 knots or less.

f) **1SM** - VISIBILITY - Prevailing visibility reported in Statute Miles.

g) **R11/P6000FT** - RVR VALUES - "R" followed by the runway number and the visual range in feet. A "P" (for plus) when the value is more than the maximum, and an "M" (for minus) when it is below the minimum. A "V" between two values indicates variable.

h) -RA BR - WX PHENOMENA - This example shows light rain showers with mist. A list of codes is in APPENDIX 1 - METAR CODES.

i) **BKN015 0VC025** - SKY CONDITIONS - The amount of cloud cover (measured in 8ths of the sky) and cloud base height. A list of codes is in APPENDIX 1 - METAR CODES

j) **06/04** - TEMP/DEW POINT - In degrees Celsius. Temperatures below zero are prefixed with an "M" (for minus).

k) **A2990** - ALTIMETER - Reported in inches of mercury. The altimeter sub-scale setting to obtain elevation when on the ground is referred to as QNH.

l) **A02 PK WND 20032/25 SLP125** - REMARKS - Included as appropriate. The range of entries for this field is beyond the scope of this study guide. Refer to the AIM for a complete description of codes used in the REMARKS field.

CHAPTER 4 - AIRSPACE CLASSIFICATIONS

4-1. Airspace generally means any specific portion of the atmosphere controlled by a particular country. In general, there are two broad classifications of airspace--controlled and uncontrolled. Additional calsses of airspace include special use airspace and other airspace areas.

- Controlled:
  Controlled airspace is airspace of defined dimensions within which air traffic control, or ATC, service is provided to controlled flights.

- Uncontrolled:
  Uncontrolled airspace is airspace in which air traffic control does not have any authority. It exists close to the ground or in mountainous terrain where safe IFR flight and radar coverage are impossible.

- Special Use:
  Special use airspace includes areas which can be hazardous to civil aircraft operations and flights may be limited or even prohibited. Examples of special

use airspace are: Alert Areas, Warning Areas, Controlled Firing Areas, Military Operations Areas, Prohibited Areas, and Restricted Areas.

- Other:
  Other airspace areas include Airport Advisory Areas, Military Training Routes, and areas where Temporary Flight Restrictions (TFRs) or limitations/prohibitions apply. For example, TFRs are often established over large forest fires to help keep aircraft from straying into hazardous conditions.

4-2. Controlled airspace
Controlled airspace exists in areas where air traffic control is capable of providing traffic separation. These would be areas where radar coverage is available, or at high altitudes where VFR flight is prohibited. This does not mean that air traffic control actually provides services to all flights in the airspace, only that such service is possible. Most airspace that is more than 1,200 feet AGL (AGL) is controlled airspace. Exceptions include mountainous terrain where radar coverage and safe IFR flight are only possible at higher altitudes. Controlled airspace is standardized by the International Civil Aviation Organisation (ICAO) and breaks down into five classes:

4-2-1. 'Class A' airspace exists only at high altitudes (transition level and above). In some countries, 'Class A' airspace also exists around very busy airports. Currently, there are no airports within Class A airspace in the VATCAR Region.
Only IFR flight is permitted in 'Class A' airspace. All other classes of controlled airspace permit both IFR and VFR flight. There is no speed limit in class A airspace (except the sound barrier over land).

4-2-1-1. 'Class A' Airspace Rules
Operations Permitted - Instrument Flight Rules Only
ATC Clearance Required - Yes
Radio Contact Required - Yes
Minimum Pilot Qualifications - Instrument Rating
Mode C Altitude Encoding Transponder Required - Yes
Cloud Clearance Requirements - None (IFR Rules apply)

4-2-2. 'Class B' airspace exists around the very busiest airports in the world -- generally major air carrier hubs (for example, Los Angeles International). All aircraft must have an explicit clearance to enter the airspace and radar coverage is mandatory.

4-2-2-1. 'Class B' Airspace Rules
Operations Permitted - IFR and VFR
ATC Clearance Required - Yes
Radio Contact Required - Yes
Minimum Pilot Qualifications - Private (Student if Signed-Off)
Mode C Altitude Reporting Transponder required - Yes
Cloud Clearance Requirements below 10,000 ft. - Clear of Clouds
Cloud Clearance Requirements above 10,000 ft. - Standard VFR

VFR Visibility Requirements below 10,000 ft. - Standard VFR
VFR Visibility Requirements above 10,000 feet - Standard VFR

4-2-2-2. When referring to ‘Class B’ airspace in pilot/controller communications the term "BRAVO AIRSPACE" is used.

4-2-3. 'Class C' airspace exists around moderately busy airports -- generally the primary airports for major cities though not major hubs (for example, Luis Muñoz Marin). Radar coverage is mandatory. All aircraft must be in two-way communication with air traffic control. An explicit clearance is not needed to enter the airspace.

4-2-3-1. 'Class C' Airspace Rules
Operations Permitted - IFR and VFR
ATC Clearance Required - IFR – Yes, VFR - No
Radio Contact Required - Yes
Minimum Pilot Qualifications - Student
Mode C Altitude Reporting Transponder required - Yes
Cloud Clearance Requirements below 10,000 ft. - Standard VFR
Cloud Clearance Requirements above 10,000 ft. - Standard VFR
VFR Visibility Requirements below 10,000 ft. - Standard VFR
VFR Visibility Requirements above 10,000 feet - Standard VFR

4-2-3-2. When referring to ‘Class C’ airspace in pilot/controller communications the term "CHARLIE AIRSPACE" is used.

4-2-4. 'Class D' airspace exists around airports with an operational control tower and that are not large enough to warrant a 'class B' or 'class C' airspace designation. Radar coverage may exist but is not mandatory (pilot position reports and tower binoculars are usually sufficient). The tower is responsible for sequencing takeoffs and landings.

4-2-4-1. Airspace ‘Class D’ Rules
Operations Permitted - IFR and VFR
ATC Clearance Required - IFR -Yes: VFR - No
Radio Contact Required - Yes
Minimum Pilot Qualifications - Student
Mode C Altitude Reporting Transponder required - No
Cloud Clearance Requirements below 10,000 ft. - Standard VFR
Cloud Clearance Requirements above 10,000 ft. - Standard VFR
VFR Visibility Requirements below 10,000 ft. - Standard VFR
VFR Visibility Requirements above 10,000 feet - Standard VFR

4-2-4-2. When referring to Class D airspace in pilot/controller communications the term "DELTA AIRSPACE" is used.

4-2-5. 'Class E' airspace exists almost everywhere else except close to the ground where Uncontrolled Airspace exists. Both VFR and IFR flight are permitted and communication with air traffic control is not required for VFR flight.

4-2-6. This internationally standardized system of controlled airspaces has replaced most countrie's own systems. Read your VATCAR ARTCC/FIR SOP for details of controlled airspace classification.

4-3. Uncontrolled Airspace
Uncontrolled airspace (also known as 'Class G' airspace) exists close to the ground where radar cover is not possible. Air traffic control does not exercise any authority in uncontrolled airspace.
Because IFR flight is not possible in uncontrolled airspace (due to ground proximity and lack of radar coverage), VFR is permitted even in extremely poor weather. VFR craft need only remain clear of clouds as there is no risk of colliding with an IFR craft emerging from that cloud. Daytime flight is permitted even if visibility is just one mile.
A common misconception is that all aircraft in controlled airspace are under the direction of air traffic control. In fact, most controlled airspace is 'class E' and aircraft are not required to have a radio to fly in this airspace.

4-3-1. Airspace 'Class G' Rules
Operations Permitted - VFR
ATC Clearance Required - No
Radio Contact Required - No
Minimum Pilot Qualifications - Student
Mode C Altitude Reporting Transponder required - No
Cloud Clearance Requirements below 10,000 ft. - Clear of Clouds (Day), Standard VFR (night)
Cloud Clearance Requirements above 10,000 ft. - Standard VFR (day and night)
VFR Visibility Requirements below 10,000 ft. - 1 SM (day): 3 SM (night)
VFR Visibility Requirements above 10,000 feet - Standard VFR (day and night)

CHAPTER 5 - RADIO AND INTERPHONE COMMUNICATIONS

5-1. The ability to communicate clearly is one of the most important requirements in air traffic control, real or simulated.

5-2. As an aid to clear communications, standard words and phrases are used. These are listed in the Pilot-Controller Glossary contained in FAAO 7110.65 and the AIM. In addition to this FAAO 7110.65 sets forth specific required phraseology for some situations. This phraseology can be identified by the notation "PHRASEOLOGY" and the use of capital letters in the examples. In addition to the mandatory phraseology, other examples of suggested phraseology are given. These can be identified by the notation "EXAMPLE." You must always use the prescribed phraseology. You should use the example phraseology whenever possible.

5-2-1. The most overused word in aviation is undoubtedly "ROGER." All it means is "I have received all of your last transmission." Don't use it as a filler to try and sound "cool" or as substitute for the proper words.

5-2-2. Use "AFFIRMATIVE" for Yes, "NEGATIVE" for No, "APPROVED" for granting permission, and 'UNABLE" when permission is denied.

5-2-3. Use the word "IMMEDIATELY" only when expeditious compliance is required to avoid an imminent situation.

5-2-4. Use the word "EXPEDITE" only when prompt compliance is required to avoid the development of an imminent situation.

5-2-5. When you find a situation which isn't covered by standard phraseology or if the pilot doesn't understand what you're saying, just use plain, simple, easy to understand English. This is even more important in ASRC than real-life because the pilots aren't able to hear your voice and sense your meaning. Additionally, for many SquawkBox pilots, English is a second language.

5-3. Interphone communications are the same as telephone communications. In ASRC this function is served by either the "Chat Box" or via VSCS Intercom (See ASRC Manual for operations).

5-3-1. You should open a chatbox with each adjacent controller when you sign on. Use it to coordinate your actions and exchange information.

5-3-2. An alternative to the chatbox is the "ATC Frequency." It should be reserved for general messages such as locating a supervisor or requesting assistance from other controllers. Anything you send over this frequency is heard by all controllers within range. They will soon get pretty annoyed if you use it for all your routine coordination. It's available to you but consider it a back-up to your chatboxes.

5-4. When you issue a clearance or control instruction to an aircraft make sure the pilot acknowledges it. Otherwise you don't know if he received it. Pilots may use the words "WILCO", "ROGER", "AFFIRMATIVE", or other words. Readbacks, while encouraged, are not specifically required unless you ask for one. Be sure to allow time for the pilot to type his response or account for any network lag before making additional requests for acknowledgements.

5-5. Do not ask for reports such as "holding short of the runway" or "established on the localizer" or "over the Outer Marker" or others of a similar type. They are unnecessary, often duplicate what you can see on your radar, and only add to everyone's workload, usually during critical phases of flight. Only ask for reports that are absolutely necessary for the safe and efficient flow of traffic.

CHAPTER 6 - COORDINATION AND HANDOFFS

6-1. Coordination is one of the keys to good air traffic control. Properly done, it makes everything smooth and easy. Poorly done, it makes working as an ATC a chore and increases everybody's workload.

6-1-1. Most coordination is nothing more than telling other controllers, who may be affected by your actions, what you have done or plan to do.

Some items you should coordinate are: Runway in use, initial departure headings and restrictions, arrival altitudes, type approach to expect, changes to an aircraft's route or final altitude, and handoff points. This is not a complete list by any means. Use your best judgment and remember: Don't keep secrets!

6-2. Handoffs are simply the transfer of responsibility for control of an aircraft from one controller to another.

6-2-1. You may not handoff any aircraft which is in conflict with another. Solve your own problems rather than trying to give them to somebody else. Don't accept a handoff with a conflict either.

6-2-2. The complete handoff procedure involves two steps:

- Notifying the next controller that you want to handoff control of an aircraft to him, and his acceptance of the handoff.

- Instructing the aircraft to contact that controller.

6-2-3. The easiest, and preferred way to do a handoff is with ASRC's automated handoff feature. Handoffs done this way usually don't require any additional chatbox coordination.

6-2-4. An alternative way to handoff would be to coordinate it in a chatbox. In this case you would send the word "Handoff" along with the aircraft's position, altitude, and any special instructions you may have issued. If the next controller accepts the handoff, he will reply "Radar Contact." You may then switch the aircraft to the next controller's frequency.

6-2-5. You should start the handoff as soon as practical. Preferably when the aircraft is about 20-30nm from horizontally leaving your airspace, or 3000-4000ft from vertically leaving your airspace. This keeps you from forgetting about it and gives the receiving controller time to coordinate any changes before accepting it.

6-2-6. Regardless of the method used, all handoffs must be completed and the aircraft switched to the next controller's frequency before the aircraft leaves your airspace. If the next controller is slow to accept, or won't take the handoff at all, you must keep the aircraft within your airspace until he does.

CHAPTER 7 - AUTOMATIC TERMINAL INFORMATION SERVICE

7-1. Use of the ATIS feature in ASRC is a major departure from real-life procedures.

7-2. In real-life, the airport's ATIS is used to broadcast routine information about the airport and weather conditions. This relieves the controllers of the responsibility to issue the same information to each individual aircraft. Very busy airports may have one ATIS for departures and one for arrivals. Keeping the ATIS up to date is normally the job of the Clearance Delivery or Ground controller.

7-3. In ASRC each controller may have his own ATIS. The result is if all ATC positions at an airport are staffed there could be five or more ATISs for that one single airport; all with different information.

7-3-1. What, if anything, you choose to put in your ATIS is up to you. However you should consider the following points.

- The information may be available to the pilots elsewhere. Pilots can easily obtain detailed, up-to-date weather information through the ACARs feature of SquawkBox.
- When you get busy you may not be able to keep your ATIS information up to date. ASRC will not always alert you when it updates weather information.

- The length of your ATIS may impact the entire ASRC/SB system. The more data you have in your ATIS the more data must be processed and sent to each aircraft that requests it. This in-turn contributes to overall system lag. The ASRC/SB programmers recommend that ATIS messages be no more than three lines long.

7-4. The following are the items normally contained in a real-life ATIS.

7-4-1. Facility name, phonetic letter code, time of weather sequence (UTC)

7-4-2. Weather information consisting of ceiling, visibility, weather phenomenon, temperature, dew point, wind, altimeter, a density altitude advisory when appropriate, and other pertinent remarks. The ceiling/sky condition, visibility, and obstructions to vision may be omitted if the ceiling is above 5,000 AGL and the visibility is more than 5 SM.

7-4-3. Instrument approach and landing runway.

7-4-4. Departure runway(s) if different from landing runway(s) or in the instance of a "departure only" ATIS.

7-4-5. NOTAMs and PIREPs.

7-4-6. Runway braking action reports.

7-4-7. Other optional information as local conditions dictate

7-4-8. Low level windshear (LLWS) reports

7-4-9. Instructions for the pilot to acknowledge receipt of the ATIS message by informing the controller on initial contact.

Example:

"Beatrix Tower Information Delta. One four zero zero Zulu. Wind one two zero at one zero. Visibility one zero. Ceiling four thousand five hundred broken. Temperature three four. Dew point two eight. Altimeter three zero one zero. ILS-DME Runway One One Approach in use. Departing Runway One One. Advise on initial contact you have Delta."

CHAPTER 8 - AIRWAYS AND ROUTE SYSTEMS

8-1. Composition of designator

8-1-1. The ATS route designator shall consist of a basic designator supplemented, if necessary, by:

- one prefix as prescribed in 8-3.; and
- one additional letter as prescribed in 8-4.

8-1-2. The number of characters required to compose the designator shall not exceed six characters and, whenever possible, be kept to a maximum of five characters.

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8-2. The basic designator shall consist of one letter of the alphabet followed by a number from 1 to 999. Selection of the letter shall be made from those listed hereunder:

8-2-1. A, B, G, R for routes which form part of the regional networks of ATS routes and are not area navigation routes;

8-2-2. L, M, N, P for area navigation routes which form part of the regional networks of ATS routes;

8-2-3. H, J, V, W for routes which do not form part of the regional networks of ATS routes and are not area navigation routes;

8-2-4. Q, T, Y, Z for area navigation routes which do not form part of the regional networks of ATS routes.

8-3. Where applicable, one supplementary letter shall be added as a prefix to the basic designator in accordance with the following:

8-3-1. K to indicate a low level route established for use primarily by helicopters;

8-3-2. U to indicate that the route or portion thereof is established in the upper airspace;

8-3-3. S to indicate a route established exclusively for use by supersonic aircraft during acceleration, deceleration and while in supersonic flight.

8-4. When prescribed by the appropriate ATS authority or on the basis of regional air navigation agreement, a supplementary letter may be added after the basic designator of the ATS route in order to indicate the type of service provided or the turn performance required on the route in question in accordance with the following:

8-4-1. For RNP (Required Navigation Performance) 1 routes at and above FL 200, the letter Y to indicate that all turns on the route between 30 and 90 degrees shall be made within the allowable RNP tolerance of a tangential arc between the straight leg segments defined with a radius of 22.5 NM (e.g. A123Y[1]);

8-4-2. For RNP 1 routes at and below FL 190, the letter Z to indicate that all turns on the route between 30 and 90 degrees shall be made within the allowable RNP tolerance of a tangential arc between the straight leg segments defined with a radius of 15 NM (e.g. G246Z[1]);

8-4-2. The letter F to indicate that on the route or portion thereof advisory service only is provided;

8-4-3. The letter G to indicate that on the route or portion thereof flight information service only is provided.

8-5. There are two main route systems established for air navigation within VATCAR: These are Low and High Altitude. They use VOR radials to provide airways between 1,500 AGL up to FL450. Above FL450 aircraft fly direct between navaids or waypoints using another means of navigation (LORAN, GPS, celestial, etc)

8-6. The VATCAR Low Altitude System consists of airways beginning at a lower limit altitude, which varies for each airway within a VATCAR ARTCC/FIR, up to but not including an upper limit altitude, which also varies for each airway within a VATCAR ARTCC/FIR. They are depicted on En Route Low Altitude Charts. The upper altitude of the low altitude airways is known as transition altitude (TA) where the local altimeter setting (QNH) is changed to 29.92 inches of mercury which is the Standard Altimeter

Setting (QNE 1013hPa). Read your VATCAR ARTCC/FIR Standard Operating Procedures for details on low altitude airway identification and TA.

8-7. The VATCAR High Altitude System consists of airways beginning at a lower limit flight level, which varies for each airway within a VATCAR ARTCC/FIR, up to an upper limit flight level, which also varies for each airway within a VATCAR ARTCC/FIR. They are depicted on En Route High Altitude Charts. High altitude airways usually share the same identification with low altitude airways and are differentiated from them by beginning with the letter “U”. The lowest FL of high altitude airways is known as the Transition Level (TL) where QNE is changed to QNH. Read your VATCAR ARTCC/FIR Standard Operating Procedures for details on low altitude airway identification and TL.

CHAPTER 9 - DUTY AND OPERATIONAL PRIORITIES

9-1. Give first priority to separating aircraft and issuing safety alerts as required. Good judgment shall be used in prioritizing all other tasks based on the requirements of the situation at hand.

9-2. Because there are many variables involved, it is virtually impossible to develop a standard list of duty priorities that would apply uniformly to every conceivable situation. Each set of circumstances must be evaluated on its own merit, and when more than one action is required, controllers shall exercise their best judgment based on the facts and circumstances known to them. That action which is most critical from a safety standpoint is performed first.

9-3. Controllers should provide additional services to the extent possible, contingent only upon higher priority duties and other factors including limitations of radar, volume of traffic, frequency congestion, and workload.

9-4. Provide air traffic control service to aircraft on a "first come, first served" basis as circumstances permit.

9-4-1. An aircraft in distress (an emergency) has the right of way over all other air traffic.

9-4-2. Provide priority to civilian air ambulance flights using the callsign "LIFEGUARD" and when requested by military aircraft using the callsign "AIR EVAC" or "MED EVAC."

9-4-3. Provide maximum assistance to Search And Rescue aircraft performing a SAR mission.

9-4-4. Expedite the movement of presidential aircraft and entourage and any rescue support aircraft as well as related control messages when traffic conditions and communications facilities permit.

9-4-5. Provide special handling, as required, to expedite "FLIGHT CHECK" aircraft. These aircraft may be used by programmers and others to calibrate sector files and/or

programs. This does not mean that "Flight Check" has priority over other aircraft, but you should be aware that he may require special assistance.
9-4-6. IFR aircraft shall have priority over Special VFR aircraft.

9-4-7. There are additional special callsigns listed in FAAO 7110.65 which are authorized special handling.

9-5. In real-life, the reasons for these priorities are obvious: Real lives and property, national security, or the integrity of the air traffic control system are at stake. Only certain people are authorized to use these special callsigns. In ASRC/SB it isn't so simple. You must use your best judgment when deciding what priority, if any, to afford these aircraft. This will be discussed more in the chapter on emergencies.

CHAPTER 10 - FLIGHT PLANS AND FLIGHT STRIPS

10-1. When a pilot files his flight plan in SB it appears in ASRC in the form of a flight strip. You must be able to read these strips in order to know what the pilot wants to do.

BLK 1	BLK 2	BLK 3	BLK 4	BLK 5	BLK 6
AAL331	I	350		JAAWS9 UTAHS R507 GTK A555 ZQA BR49V FOWEE.FOWEE5	4101
T/B737/F	TJSJ - KMIA				KMIA
T400G540	KMCO				
854 01			310	/V CHARTS NEW PILOT	

Block 1 - Aircraft Information

- **AAL331 -** Aircraft Callsign
- **T/B737/F -** Aircraft engine type / Aircraft Mfg and model information / Aircraft equipment codes (See Appendix 2)
- **T400G543 -** Filed True airspeed and estimated Ground speed
- **854 01 -** Computer assigned ID code

Block 2 – Flight type and airport information

- **I -** IFR/VFR Flight type
- **TJSJ – KMIA -** Departure airport – Destination airport
- **KMCO** – Alternate airport

Block 3 – Filed Cruise Altitude

- Formatted as TTH where TT = feet in thousands and H = feet in hundreds

Block 4 – Temporary Assigned Altitude

- Same format as Cruise Altitude

Block 5 - Flight plan route and pilot remarks

Block 6 - Assigned Squawk Code

10-2. Because the strip only shows what the pilot has entered in his flight plan, some areas require further explanation.

10-2-2. Often pilots don't enter the aircraft type and equipment using the proper abbreviations. This may change in a future version of SquawkBox. In the meantime it usually doesn't cause much of a problem.

10-2-3. All aircraft connected to SquawkBox have a four-digit, from 0 to 7, transponder capable of selecting 4096 discrete codes with automatic altitude reporting on Mode (C)harlie, also referred to as "Squawk Normal".

10-2-4. SquawkBox currently provides a built in Global Positioning System/Flight Management System (GPS/FMS) navigation system along with a **T**raffic alert and **C**ollision **A**voidance **S**ystem (TCAS) display; however, not all pilots use these features. Common reasons are because they don't know how, because they want to practice VOR navigation, or because it doesn't fit in with the type aircraft they choose to fly (e.g., flying in small general aviation aircraft while using a GPS/FMS which, in real-life, costs more than the airplane itself or flying a vintage 1940's aircraft using 1990s navigation equipment.) Refer to Appendix 2 - Aircraft Equipment Codes for more information.

10-2-5. You may find the pilot's requested altitude is wrong for his direction of flight or altitude stratum.

10-2-6. The VATCAR IFR Flight Level Allocation Scheme is as follows:

Non RVSM Airspace NEODD-SWEVEN VFR + 500 feet		Non RVSM Airspace NEODD-SWEVEN VFR + 500 feet (Continued)		RVSM Airspace Non RVSM flights use 2000 feet separation		Non RVSM Airspace 2000 feet separation	
from 180º	from 000º	from 180º	from 000º	from 180º	from 000º	from 180º	from 000º
to 359º	to 179º	to 359º	to 179º	to 359º	to 179º	to 359º	to 179º
← FL020		← FL160				← FL430	
	FL030 →		FL170 →		FL290 →		FL450 →
← FL040		← FL180		← FL300		← FL470	
	FL050 →		FL190 →		FL310 →		FL490 →
← FL060		← FL200		← FL320		← FL510	
	FL070 →		FL210 →		FL330 →		FL530 →
← FL080		← FL220		← FL340		← FL550	

	FL090 →		FL230 →		FL350 →		FL570 →
← FL100		← FL240		← FL360		← FL590	
	FL110 →		FL250 →		FL370 →		
← FL120		← FL260		← FL380			
	FL130 →		FL270 →		FL390 →		
← FL140		← FL280		← FL400			
	FL150 →				FL410 →		

VATCAR FIRs/ARTCC might have additional restrictions for flight level use based on this Flight Level Allocation System.

10-2-6-1. From the minimum enroute altitude of the airway in use and up to FL290, the NEODD – SWEVEN rules will apply. Aircraft heading North and East (on a course of between 360-179 degrees) should be assigned ODD altitudes at 2,000 ft intervals, while aircraft heading South and West (between 180-359 degrees) should be assigned EVEN altitudes at 2,000' intervals. This allows for the required 1,000' separation between aircraft on opposing headings.

10-2-6-2. From FL 290 thru FL410, altitudes are assigned according to the "Reduced Vertical Separation Minimum" (RVSM) operational rules. Aircraft approved for RVSM operation are required to be equipped with either ACAS III or TCAS v7 Collision Avoidance Systems. Most real-world commercial and corporate aircraft and some larger GA aircraft are RVSM approved. As all aircraft flying on the VATSIM network are currently equipped with TCAS, they will be considered as RVSM approved, unless the pilot specifically states otherwise in the remarks section of his flight plan.

RVSM approved aircraft can be identified by either the /W or /Q Aircraft Equipment Code suffix.

- RVSM approved aircraft will be assigned altitudes from FL290 thru FL410 based on the NEODD – SWEVEN rules above.

- Non-RVSM approved aircraft can be assigned any flight level within the RVSM airspace in compliance with the above system, however, a minimum 2000 feet vertical separation must be applied with all other RVSM approved or Non-RVSM approved aircraft.

  Example: A Non-RVSM approved aircraft has filed to fly eastbound at FL330 however, there's another aircraft flying westbound on the same airway cleared to fly at FL320. As a minimum 2000 feet vertical separation must be applied, the Non-RVSM approved aircraft may only be cleared for a temporary cruise altitude of FL290, and after both aircraft cross their path the Non-RVSM aircraft may be cleared for FL330.

  As Non-RVSM approved aircraft flying within RVSM airspace are an exception to the rule, make your best effort to make changes in the cruising levels only to the

Non-RVSM approved aircraft to cope with the minimum 2000 feet vertical separation even if it involves using non RVSM airspace.

From FL430 to FL590, aircraft will be assigned only ODD altitudes, alternating between Westbound and Eastbound, allowing 2,000 ft separation between opposing directions.

10-3. Only military aircraft are authorized to fly at FL600 and above. They can fly at any flight level as long as they are separated by at least 4,000 ft.

10-4. You should issue a correct altitude and have the pilot correct his flight plan so it is reflected on the strip for later controllers.

10-4. VFR aircraft are required to follow the NEODD-SWEVEN rule plus 500 feet (e.g., eastbound at 7500 MSL, westbound at 8500 MSL) .

10-6. The requested route is often a clue to the pilot's proficiency. A blank, or the bare minimum of departure and destination, may mean a new pilot unfamiliar with IFR navigation; a full route with a Departure Procedure (DP), Standard Terminal Arrival Route (STAR), and airways may indicate a pilot who takes his simming seriously. You must use your best judgment when you encounter one extreme or the other.

10-7. Airports will usually have a four letter identifier. VORs always use three-letter identifiers. NDBs may use 2 or 3 letters. Other fixes will have a 5 letter or a 5 character combination of letters and numbers name. DPs and STARs will have a 3, 4, or 5 letter and one number name often followed by a period(.) and an additional three letters. And, as you have already learned, airways will be a combination of letters and numbers from 2 to 6 characters long.

10-8. Pilot remarks can be, and often are, anything the pilot wants to enter. Some common remarks are ASRC codes for communication methods, "STUDENT PILOT", "NO CHARTS", and "NO DPs/NO STARs" which means the pilot will not accept any route which contains a DP or STAR.

CHAPTER 11 - IFR CLEARANCES

11-1. An IFR clearance is authorization for an aircraft to operate under instrument flight rules in controlled airspace along a route and altitude specified by ATC. It is not clearance to taxi, takeoff, fly an instrument approach, or land.

11-1-1. When an aircraft calls for its IFR clearance, unless you are ready to issue it right away, you should tell the aircraft "CLEARANCE ON REQUEST." That will give you a few minutes to review the flight strip and formulate the clearance.

11-1-2. When you're ready, you should tell the aircraft "CLEARANCE AVAILABLE, ADVISE WHEN READY TO COPY" or "CLEARANCE AVAILABLE WITH

AMENDMENT, ADVISE WHEN READY TO COPY". This will give the pilot a chance to finish whatever he's doing and get ready to copy the clearance.

11-2. A detailed IFR clearance contains nine items in the following order:
1. Aircraft Identification
2. Clearance Limit
3. Departure Procedure
4. Route of Flight
5. Altitude in order flown
6. Holding Instructions
7. Special Information
8. Departure Frequency
9. Transponder Code

11-3. All IFR clearances MUST contain a clearance limit, route, and altitude as a MINIMUM. In practice, the nine detailed items are usually reduced down to five basic elements:

11-3-1. Clearance limit. This is the farthest point along its route the aircraft may fly. Usually it will be the destination airport but it may also be an intermediate fix where the aircraft will be required to hold.

11-3-2. Route of flight. This is the route the aircraft will take to get to its clearance limit. Usually it will be whatever is in the pilot's flight plan or "As Filed." However, you may need to change it depending on traffic and other factors. For VFR aircraft wanting a pop-up IFR clearance with nothing filed, the route is usually "via radar vectors."

11-3-3. **A**ltitude. This will usually be the altitude the pilot filed in his flight plan or a corrected one close to it. When working APP/DEP with a CTR you should assign an intermediate altitude which will keep the aircraft in your airspace until you have completed the handoff to CTR. This altitude should be the highest possible consistent with traffic and airspace. The aircraft should be told to expect its final altitude sometime (normally 10 minutes) after departure.

11-3-4. Frequency for departure control. This is normally given by the Ground ATC so the pilot can be prepared. If you are issuing a clearance from APP, DEP, or CTR the aircraft is already on the departure frequency, so you may omit this item.

11-3-5. As you can see, this results in the easy to remember mnemonic of **CRAFT**. **C**learance limit, **R**oute, **A**ltitude, **F**requency, **T**ransponder.

11-3-6. Transponder code. In real-life, transponder codes are assigned by computer to prevent two aircraft getting the same code. In ASRC, squawk codes are assigned from a list defined in the position file (.POF), or they can be assigned manually if necessary.

Some ARTCCs have SOPs or LOAs telling which codes to assign and there are a few codes that are reserved for special use. You should not assign these reserved codes to a normal aircraft.

- 1200 is reserved for VFR aircraft not under ATC control. It is the default SB code.
- 1255 is for VFR aircraft engaged in fighting forest fires;
- 1277 is for VFR aircraft engaged in Search-and-Rescue operations.
- 4000 is reserved for VFR military aircraft on training missions.
- 4400-4477 are reserved for aircraft operating above FL600.
- 7500 is the hijack code.
- 7600 is the lost communications code.
- 7700 is the Emergency code.

11-4. The most common way to issue an IFR clearance is as an "Abbreviated Departure Clearance." When using this method detailed route information is omitted and the phrase "as filed" is used instead. This phrase applies only to the route portion; not the clearance limit or altitude. An example of an abbreviated departure clearance would be:

"AMERICAN 305 CLEARED TO WILL ROGERS AIRPORT AS FILED. CLIMB AND MAINTAIN 5,000, EXPECT FL220 TEN MINUTES AFTER DEPARTURE, DEPARTURE FREQUENCY 135.1, SQUAWK 2201."

11-4-1. When a Departure Procedure (DP) is included the phraseology changes a little. An example of an abbreviated departure clearance with a DP would be:

"AMERICAN 305 CLEARED TO WILL ROGERS AIRPORT, EUGEN FIVE DEPARTURE, BIG SUR TRANSITION, THEN AS FILED. CLIMB AND MAINTAIN 5,000, EXPECT FL220 TEN MINUTES AFTER DEPARTURE, DEPARTURE FREQUENCY 135.1, SQUAWK 2201."

11-4-2. If it is necessary to change the aircraft's route, the phraseology changes yet again. An example of an abbreviated departure clearance with a route change would be:

"AMERICAN 305 CLEARED TO WILL ROGERS AIRPORT AS FILED, EXCEPT CHANGE ROUTE TO READ OAKLAND J-1 AVENAL. CLIMB AND MAINTAIN 5,000, EXPECT FL220 TEN MINUTES AFTER DEPARTURE, DEPARTURE FREQUENCY 135.1, SQUAWK 2201."

11-5. Pilot readback of the complete IFR clearance is not required, but if he does, you must make sure he does it correctly. If he does, tell him "READBACK CORRECT." If he doesn't, issue a correction until he gets it right.

CHAPTER 12 - EMERGENCY OPERATIONS

12-1. As stated before in the Operational Priorities chapter, the need to provide special handling and priority to emergency aircraft is obvious: Real lives and property are at stake. Real-life pilots cannot just hit the "PAUSE" key, fix or refuel their airplane, and resume normal flight. In real-life hijackings and bomb threats do occur.

12-2. In our simulated world none of the above are true. If a simulated aircraft crashes the pilot simply resets his computer and tries it again. If he is low on fuel he can simply go to the "Options Menu" and refuel. His aircraft (or computer) isn't really going anyplace if hijacked nor will it explode if he receives a bomb threat.

12-3. Any special handling you provide to these "emergency" aircraft may reduce the quality of service you provide to the remaining aircraft under your control. Unfortunately, there have been instances of pilots declaring an "emergency" because they failed to compute their fuel requirements properly or simply because they wanted to be first to land. For these reasons and more an unofficial rule or understanding has developed: Aircraft should not declare an emergency without first obtaining approval from the controller. If the pilot requests to declare an emergency, or even if he doesn't, you are completely within your rights to state "UNABLE EMERGENCY." Any disagreements or conflicts this may create should be referred to VATSIM management for resolution.

12-4. The remainder of this chapter will cover procedures you should use if you elect to handle an aircraft as an emergency.

12-4-1. An emergency can be either a Distress or an Urgency condition as defined in the FAAO 7110.65 or AIM "Pilot-Controller Glossary."

12-4-2. A pilot who encounters a Distress condition should declare an emergency by beginning the initial communication with the words "MAYDAY-MAYDAY-MAYDAY." For an Urgency condition, the pilot should use the words "PAN-PAN-PAN." If these words are not used and you are in doubt that a situation constitutes an emergency or potential emergency, handle it as though it were an emergency.

12-4-3. Because of the infinite variety of possible emergency situations, specific procedures cannot be prescribed. However, when you believe an emergency exists or is imminent, select and pursue a course of action which appears to be most appropriate under the circumstances.

12-4-4. Consider that an aircraft emergency exists when an emergency is declared by the pilot or air traffic control personnel, or when an emergency radar beacon code (7700) is observed.

12-4-5. Start assistance as soon as enough information has been obtained upon which to act. Information requirements will vary, depending on the existing situation.

12-4-6. Minimum required information for an emergency is: Aircraft identification and type, nature of the emergency, and pilot's desires.

12-4-7. Consider the following factors when recommending an emergency airport: Remaining fuel in relation to airport distances, weather conditions, airport conditions, navaid availability, aircraft type, and pilot's qualifications.

12-4-8. When you observe a Hijack beacon code (7500) acknowledge and confirm receipt of Code 7500 by asking the pilot "VERIFY SQUAWKING 7500."

12-4-8-1. If the aircraft is not being hijacked the pilot should respond in the clear that he is not being hijacked.

12-4-8-2. If the pilot confirms he is on code 7500 or if no reply is received, do not question the pilot further but be responsive to the aircraft requests.

12-4-8-3. Continue to observe the aircraft and use normal handoff procedures without requiring transmissions or responses from the aircraft unless communications have already been established.

12-4-8-4. If aircraft are dispatched to escort the hijacked aircraft, provide all possible assistance to the escort aircraft to aid in placing them in a position behind the hijacked aircraft.

12-5. If a VFR aircraft requests radar assistance when it encounters or is about to encounter IFR weather conditions, ask the pilot if he is capable of conducting IFR flight.

12-5-1. If the pilot is capable of IFR flight, issue an IFR clearance.

12-5-2. If the pilot is not capable of conducting IFR flight, or refuses an IFR clearance, inform the pilot of airports where VFR conditions are reported.

12-5-3. If the aircraft has already encountered IFR conditions, inform the pilot of the appropriate minimum altitude. If the aircraft is below the appropriate minimum altitude, furnish a heading on which to climb to the appropriate minimum altitude.

12-6. When aircraft bomb threat information is received, handle the aircraft as an emergency. Provide the most expeditious handling possible with respect to the safety of other aircraft, ground facilities, and personnel.

12-6-1. When a bomb threat involves an aircraft on the ground, recommend that takeoff be delayed until the pilot or aircraft operator establishes that a bomb is not aboard. If the pilot insists on taking off and in your opinion the operation will not adversely affect other traffic, issue an ATC clearance.

12-6-2. If the bomb threat is general in nature or directed against the VATNET system notify a supervisor.

12-7. Whenever any of these "emergencies" occur both you and the pilot are required to file an Emergency Report with VATCAR Headquarters (http://www.vatcar.org)

APPENDIX 1 - METAR CODES

SKY CONDITIONS

CLR Sky Clear 0/8
BKN Broken Clouds 5/8-7/8
FEW Few Clouds 1/8-2/8
OVC Overcast 8/8
SCT Scattered Clouds 3/8-4/8

WEATHER PHENOMENA

QUALIFIERS

- Light
Moderate (no plus or minus)
+ Heavy

DESCRIPTORS

BC Patches
MI Shallow
BL Blowing
PR Partial
DR Drifting
SH Showers
FZ Freezing
TS Thunderstorm

PRECIPITATION

DZ Drizzle
RA Rain
GR Hail
SG Snow grains
GS Small hail/snow pellets
SN Snow
IC Ice Crystals
UP Unknown
PE Ice pellets

OBSCURATIONS

BR Mist
PY Spray
DU Widespread Dust
SA Sand
FU Smoke
VA Volcanic Ash

HZ Haze
DS Dust storm whirls
PO Well developed dust/sand
FC Funnel Cloud
SQ Squall
+FC Tornado/Waterspout
SS Sandstorm

APPENDIX 2 - AIRCRAFT EQUIPMENT CODES

Prefixes

Number of Aircraft (if more than one) (Number)/

TCAS equipped T/

Heavy Aircraft H/

TCAS equipped Heavy Aircraft B/

Boeing 757 F/

TCAS equipped Boeing 757 L/

NOTE: Each aircraft connected to SquawkBox must have an individual flight plan; the software does not allow more than one aircraft per flight plan. If a flight plan shows a prefix of more than one aircraft you should determine which other aircraft will be in the formation flight and who will be the flight leader.

Suffixes

Flight Plan Aircraft Suffixes: Effective November 25, 2004

Suffix	Equipment Capability
	NO DME
/X	No transponder
/T	Transponder with no Mode C
/U	Transponder with Mode C
	DME
/D	No transponder
/B	Transponder with no Mode C

/A Transponder with Mode C

TACAN ONLY

/M No transponder

/N Transponder with no Mode C

/P Transponder with Mode C

AREA NAVIGATION (RNAV)

/Y LORAN, VOR/DME, or INS with no transponder

/C LORAN, VOR/DME, or INS, transponder with no Mode C

/I LORAN, VOR/DME, or INS, transponder with Mode C

ADVANCED RNAV WITH TRANSPONDER AND MODE C (If an aircraft is unable to operate with a transponder and/or Mode C, it will revert to the appropriate code listed above under Area Navigation.)

/E Flight Management System (FMS) with en route, terminal, and approach capability. Equipment requirements are:
(a) Dual FMS which meets the specifications of AC 25-15, Approval of Flight Management Systems in Transport Category Airplanes; AC 20-129, Airworthiness Approval of Vertical Navigation (VNAV) Systems for use in the U.S. NAS and Alaska; AC 20-130A, Airworthiness Approval of Navigation or Flight Management Systems Integrating Multiple Navigation Sensors; or equivalent criteria as approved by Flight Standards.
(b) A flight director and autopilot control system capable of following the lateral and vertical FMS flight path.
(c) At least dual inertial reference units (IRUs).
(d) A database containing the waypoints and speed/altitude constraints for the route and/or procedure to be flown that is automatically loaded into the FMS flight plan.
(e) An electronic map.
(U.S. and U.S. territories only unless otherwise authorized.)

/F FMS with en route, terminal, and approach capability. Unless otherwise authorized by the Administrator, equipment requirements are:
(a) Single FMS which meets the specifications of AC 25-15, Approval of Flight Management Systems in Transport Category Airplanes; AC 20-129, Airworthiness Approval of Vertical Navigation (VNAV) Systems for use in the U.S. NAS and Alaska; AC 20-130A, Airworthiness Approval of Navigation or Flight Management Systems Integrating Multiple Navigation Sensors; or equivalent criteria as approved by Flight Standards.
(b) A demonstrated capability of depicting and following the lateral and vertical path.
(c) An FMS with DME/DME updating and one or more of the following: Single Global Positioning System (GPS) - Single inertial reference unit (IRU).
(d) A database containing the waypoints and speed/altitude constraints for the route and/or procedure to be flown that is automatically loaded into the FMS flight plan.
(U.S. and U.S. territories only unless otherwise authorized.)

/G Global Navigation Satellite System (GNSS), including GPS or WAAS, with enroute and terminal capability.

/R Required Navigational Performance. The aircraft meets the RNP type prescribed for the route segment(s), route(s) and/or area concerned.
Reduced Vertical Separation Minimum (RVSM). Prior to conducting RVSM operations within the U.S. , the operator must obtain authorization from the FAA or from the responsible authority, as appropriate.

/Q RVSM **with** /E, /F, /G, or /R capability, **except** aircraft operating in Oakland Oceanic or Anchorage Oceanic CTA/FIRs must be RVSM with /R capability.

/W RVSM

NOTES:

1. Codes /X, /T, /D, /B, /M, /N, /P, /Y, and /C are for aircraft not equipped with an altitude reporting (Mode C) transponder and/or VOR/ILS navigation equipment. These codes should not be used in ASRC/SB.

2. Code /U equipped aircraft are not capable of locating DME fixes or flying procedures with "DME" in the title (eg ILS-DME RWY 32) or containing the note "DME REQUIRED" on the chart.

3. Code /U and /A equipped aircraft may not be able to fly direct to fixes other than VORs and NDBs. They may require vectors or other alternate routing.

4. Codes /I. /E, /F, /G, /R, and /W are various types of lat-long, Inertial Navigation, Global Positioning, or Flight Management Systems capable of direct or point-to-point navigation without the use of VORs or NDBs.