BASIC AIR TRAFFIC CONTROL

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Chapter 1 – The Air Traffic Control Mission

1-1. The mission of Air Traffic Control can be stated by several definitions that include task that a controller is expected to follow every time he/she performs their job. The most commonly used definition is:

"Controllers shall provide Air Traffic Control Services in accordance with international standards and regulations as well as providing Flight Information Services and Alerting Services to ensure safe, convenient and expeditious air travel. The role also includes coordinating search and rescue operations."

1-2. Simply put, don't allow aircraft to crash into one another, make sure they get where they're supposed to go quickly, efficiently and safely and to support military when requested to do so.

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 pure physical inability to scan and detect those situations that fall in this category.

Chapter 2 – ATC Positions and Functions

2-1. There are three basic types of ATC facilities: Control Towers (Aerodrome Control Service), Approach Controllers (Approach Control Service), and Air Route Traffic control Centers (Area Control Service). 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 and VFR clearances into Controlled airspace.

2-3. Ground Controller (GND) – Located in the Control Tower, Ground exercises control over taxing 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) or Aerodrome Control Service - Located in the Control Tower. This controller is in control of all arriving and departing on the runways and in the air at a 5 mile radius extending up to 2500AGL. Tower Controller and provides services to VFR aircraft in the pattern and selects the active runways.

2-5. Approach Controller (APP) or Approach Control Service – 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 many include 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 and High Approach. Each sector is responsible for a piece of the Approach control's overall airspace. When a sector's airspace includes Class C airspace the position also controls VFR aircraft in the sector.

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) or Area Control Service – Located in the vACC, the Center Controller provides ATC services to all aircraft operating on IFR flight plans with in controlled airspace principally during the enroute phase of flight. Like Approach controls, vACC may also be broken up into smaller sectors with each sector being responsible for its piece of the overall airspace.

Chapter 3 – National Airspace System

3-1. The first level of airspace classification in Thailand is Controlled and Uncontrolled. Controlled airspace is that airspace where air traffic services are provided. All commercial airports in Thailand are controlled. Uncontrolled airspace pilots are to provide their own separation and avoid other aircraft. Thailand airspace can be broken down into 7 category s. Thailand airspace classification can be found in the Thailand AIP ENR 1.4

3-2. Class A airspace – is that airspace starting at FL290 and above (along ATS routes). Only IFR flights are permitted in class A airspace and are subject to air traffic services and are separated from each other.

3-3. Class B airspace – is that airspace starting at FL280 and below (along ATS routes). IFR and VFR flights are permitted in class B airspace and are subject to air traffic services and are separated from each other.
VFR aircraft operating in class B airspace require the following conditions:
- 8km visibility and clear of clouds above 3050m (10,000 ft) AMSL
- 5km visibility and clear of clouds below 3050m (10,000 ft) AMSL

3-4. Class C airspace – is that airspace that surrounds controlled airports and is known as the Approach Control Services area. This airspace can extend anywhere from 10 to 50 miles out from the airport and extend from the surface up to FL160. The class C airspace designation is used for the busiest airports. IFR aircraft are separated from IFR and VFR aircraft. VFR aircraft are separated from IFR aircraft. All aircraft operating below 3050m (10,000 ft) in class C airspace must maintain airspeed of 250 IAS or less. VFR aircraft operating in class C airspace require the following conditions:
- 8km visibility; 1500m horizontal; 300m vertical distance from clouds above 3050m (10,000 ft) AMSL
- 5km visibility; 1500m horizontal; 300m vertical distance from clouds below3050m (10,000 ft) AMSL

3-5. Class D airspace – is that airspace that surrounds controlled airports and is known as the Approach Control Services area. This airspace can extend anywhere from 10 to 50 miles out from the airport and extend from the surface up to FL160. The class D airspace designation is used for the less busy airports. IFR aircraft are separated from IFR aircraft. NO separation services are provided to VFR aircraft. VFR aircraft are given traffic information in respect to all other flights. All aircraft operating below 3050m (10,000 ft) in class D airspace must maintain airspeed of 250 IAS or less. VFR aircraft operating in class D airspace require the following conditions:
- 8km visibility; 1500m horizontal; 300m vertical distance from clouds above 3050m (10,000 ft) AMSL
- 5km visibility; 1500m horizontal; 300m vertical distance from clouds below3050m (10,000 ft) AMSL

3-6. Class E airspace – is that controlled airspace not designated as Class, A, B, C or D airspace. IFR aircraft are separated for IFR Aircraft and provided with information about VFR flights. No separation services are provided to VFR aircraft. Traffic information is provided to VFR aircraft when practical. All aircraft operating below 3050m (10,000 ft) in class E airspace must maintain airspeed of 250 IAS or less. VFR aircraft operating in class E airspace require the following conditions:
- 8km visibility; 1500m horizontal; 300m vertical distance from clouds above 3050m (10,000 ft) AMSL
- 5km visibility; 1500m horizontal; 300m vertical distance from clouds below3050m (10,000 ft) AMSL

3-7. Class F airspace – is uncontrolled airspace. IFR aircraft are separated for IFR Aircraft as far as practical. VFR aircraft are not provided with separation services. All aircraft operating below 3050m (10,000 ft) in class F airspace must maintain airspeed of 250 IAS or less. VFR aircraft operating in class F airspace require the following conditions:
- 8km visibility; 1500m horizontal; 300m vertical distance from clouds above 3050m (10,000 ft) AMSL
- 5km visibility; 1500m horizontal; 300m vertical distance from clouds below3050m (10,000 ft) AMSL
- At and below 900m AMSL or 300m above terrain whichever is higher 5km clear of clouds and in sight of ground or water

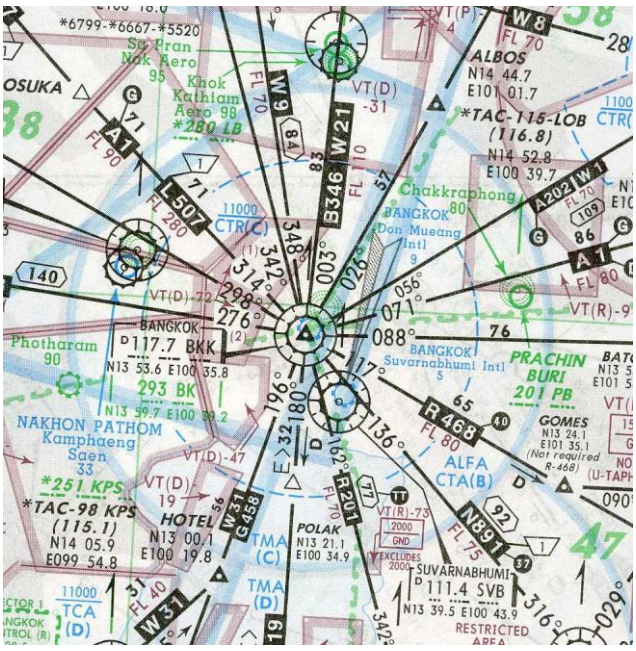
3-8. Class G airspace – is uncontrolled airspace not classified as class F airspace. Both IFR and VFR aircraft are not provided with separation services. All aircraft operating below 3050m (10,000 ft) in class G airspace must maintain airspeed of 250 IAS or less. VFR aircraft operating in class G airspace require the following conditions:
- 8km visibility; 1500m horizontal; 300m vertical distance from clouds above 3050m (10,000 ft) AMSL
- 5km visibility; 1500m horizontal; 300m vertical distance from clouds below3050m (10,000 ft) AMSL
- At and below 900m AMSL or 300m above terrain whichever is higher 5km clear of clouds and in sight of ground or water.

3-9. Special Use Airspace - Special Use Airspace is airspace that has been defined to support the critical mission requirements of other government agencies, protect vital national facilities, or is otherwise necessary for the safety and security of both the airspace and surface installations. Thailand Special use airspace can be found in Thailand AIP ENR5.1

- Danger Areas: An airspace of defined dimensions within which activities dangerous to the flight of aircraft may exist at specified time.
- Restricted Areas: An airspace of defined dimensions above the land areas or territorial waters of a state within which the flight of aircraft is restricted in accordance with certain specified conditions. Example; R2 Chitrlada Palace which is the Royal Residence.
- Prohibited Areas: An airspace of defined dimensions above the land areas or territorial waters of a state within which the flight of aircraft is prohibited.

3-10. AIR ROUTE SYSTEM (ATS): Thailand air route system is separated into International and Domestic route systems. Thailand air routes can be found in ENR 3.1-1.

- International air routes: International Routes are identified by a letter and followed by the route number. The letters listed below are used for international routes in Thailand:
  i. A example (A1)
  ii. B example (B202)
  iii. G example (G473)
  iv. R example (R215)
  v. M Example (M751)
- Domestic air routes: Domestic Routes are identified with the letter “W” and followed by the route number. Domestic airways do not extend beyond the Thailand boundaries. Examples W1, W26, W31.



Example of Thailand Airway system with Navigational aids

3-11. Components of a route: The first is a VOR (**V**HF **O**mni-directional **R**ange). A VOR, simply put, is a type of radio navigation system for aircraft. VORs broadcast a VHF radio signal encoding both the identity of the station and the angle to it, telling the pilot in what direction he lies from the VOR station, referred to as the radial. The second is a NDB (**N**on-**D**irectional **B**eacon). NDB bearings provide a charted, consistent method for defining paths aircraft can fly, similar in the way a VOR does. NDB are still primary sources of navigation in Thailand. Unlike the USA VOR's and NDB's are the primary navigational aids used in Instrument approaches since many of Thailand's airports do not have ILS/Localizer approaches. The final component commonly seen on a route is the fix. Fixes, literally, are points in the sky. Fixes are plotted by finding the point where two radials, from two different VORs intersect. This usage is important in situations where other navigational equipment, such as VORs with a DME have failed.

Chapter 4 – Weather

Decoding Aviation Weather Products

We have several ways of knowing what the weather currently is and what is predicted to be. The two most common reports generated by the National Weather Service for aviation use are the Aviation Routine Meteorological Report (METAR) and the Terminal Aerodrome Forecast (TAF).

4-1 METAR

METAR VTBS 132000Z 17008KT 9999 FEW020 SCT300 30/24 Q1006 NOSIG A typical METAR report (shown above) contains the following information in sequential order. Color has been added to identify each section.

a. **Type of Report** - There are two types of METAR reports. The first is the routine METAR report that is transmitted every hour. The second is the aviation selected special weather report (SPECI). This is a special report that can be given at any time to update the METAR for rapidly changing weather conditions, aircraft mishaps, or other critical information.

b. **Station Identifier** - Each station is identified by a four-letter code as established by the International Civil Aviation Organization (ICAO). In Thailand, a unique three-letter identifier is preceded by the letter "V." For example, Suvarnabhumi International, is identified by the letters "VTBS," V being the country designation and TBS being the airport identifier.

c. **Date and Time of Report** - The date and time (132000Z) are depicted in a six-digit group. The first two digits of the six-digit group are the date. The last four digits are the time of the METAR, which is always given in Coordinated Universal Time (UTC). A "Z" is appended to the end of the time to denote the time is given in Zulu time (UTC) as opposed to local time.

d. **Modifier** - Modifiers denote that the METAR came from an automated source or that the report was corrected. If the notation "AUTO" is listed in the METAR, the report came from an automated source. It also lists "AO1" or "AO2" in the remarks section to indicate the type of precipitation sensors employed at the automated station. When the modifier "COR" is used it identifies a corrected report sent out to replace an earlier report that contained an error.

e. **Winds** - Winds are reported with five digits (17008) unless the speed is greater than 99 knots, in which case the wind is reported with six digits. The first three digits indicate the direction the wind is blowing, rounded to tens of degrees from true north (not magnetic north). If the wind is variable, it is reported as "VRB." The last two digits indicate the speed of the wind in knots (KT) unless the wind is greater than 99 knots, in which case it is indicated by three digits. If the winds are gusting, the letter "G" follows the wind speed (G26). After the letter "G," the peak gust recorded is provided. If the wind varies more than 60 degrees and the wind speed is greater than 6 knots, a separate group of numbers, separated by a "V," will indicate the extremes of the wind directions.

f. **Visibility** - The prevailing visibility (9999) is reported in Meters.

g. **Weather** - Weather can be broken down into two different categories: qualifiers and weather phenomenon (-RA). First, the qualifiers of intensity, proximity, and the descriptor of the weather will be given. The intensity may be light (-), moderate ( ), or heavy (+). Proximity only depicts weather phenomena that are in the airport vicinity. The notation "VC" indicates a specific weather phenomenon is in the vicinity of 5 to 10 miles from the airport. Descriptors are used to describe certain types of precipitation and obscurations. Weather phenomena may be reported as being precipitation, obscurations, and other phenomena such as squalls or funnel clouds.

h. **Sky Condition** - Sky condition (FEW020 SCT300) is always reported in the sequence of amount, height, and type or indefinite ceiling/height (vertical visibility). The heights of the cloud bases are reported with a three-digit number in hundreds of feet above the ground. Clouds above 12,000 feet are not detected or reported by an automated station. The types of clouds, specifically towering cumulus (TCU) or cumulonimbus (CB) clouds, are reported with their height. Contractions are used to describe the amount of

cloud coverage and obscuring phenomena. The amount of sky coverage is reported in eighths of the sky from horizon to horizon.

i. **Temperature and Dewpoint** - The air temperature and dewpoint are always given in degrees Celsius (30/24). Temperatures below 0C are preceded by the letter "M" to indicate minus.

j. **Altimeter Setting** - The altimeter setting is reported as QNH (Q1006). It is always preceded by the letter "Q." Rising or falling pressure may also be denoted in the remarks sections as "PRESRR" or "PRESFR" respectively.

k. **Remarks** - Comments may or may not appear in this section of the METAR. The information contained in this section may include wind data, variable visibility, beginning and ending times of particular phenomenon, pressure information, and various other information deemed necessary. An example of a remark regarding weather phenomenon that does not fit in any other category would be: OCNL LTGICCG. This translates as occasional lightning in the clouds, and from cloud to ground. Automated stations also use the remarks section to indicate the equipment needs maintenance. The remarks section always begins with the letters "RMK." Refer to the charts below for descriptors and weather phenomena used in a typical METAR, as well as reportable contractions for sky conditions.

4-2 TAF

Decoding a Terminal Aerodrome Forecast (TAF) is a little more involved as it has more information in it. Again, color has been added to assist with the decoding explanation.

TAF VTBS 131700Z 1318/1418 17005KT 9999 FEW020 SCT300
BECMG 14 01/1403 20010KT 9999 FEW020 BKN300
TEMPO 1406/1411 F EW020CB SCT120 BKN300
BECMG 1412/1414 18005KT FEW020 SCT300

a. **Station Identifier** – Identical to the METAR.

b. **Date and Time of Report** – You've already seen this from the METAR.

c. **Valid Period** – The valid period is the time which the report is valid for. A TAF is valid for 24 hours from the time of issuance. In this case, it is valid from 1800 Zulu on the 17th to 1800 Zulu the following day.

d. **Winds** – Identical to the METAR.

e. **Visibility** – Identical to the METAR.

f. **Weather** – Identical to the METAR.

g. **Sky Condition** – Identical to the METAR.

h. **Modifier** – Occasionally a TAF will have the line TEMPO. This indicates that temporarily during the valid time given the weather differs from the forecasted. In this case, temporarily from 2000 Zulu to 2200 Zulu there will be Thunderstorms and Cumulonimbus Clouds Broken at 2,500 feet and Broken Clouds at 5,000 feet.

These areas are repeated for each time block of the forecast. TAF's however do not have remarks since they are forecasts and not current observations of the weather.

Chapter 5 – ATC Communications and Coordination

5-1 Air Traffic Control is truly the art of concise communication. Communication between controller and aircraft or controller and controller is what this is all about. But, it's not just getting on the radio (or in the case of VATSIM, a computer) and saying, "GO THERE!" There is a precise language that Air Traffic Controllers use to communicate their instructions and provide pertinent information. It is essential that controllers understand what proper phraseology is and how it enhances safety and is the mark of a professional controller.

5-2 The Phonetic Alphabet

In aviation, we even have our own version of the alphabet. It uses the same letters but instead of just saying "A" we give each work and pro-word. This allows us to clearly communicate to minimize language barriers and misunderstandings.

Letter	Spelt	Pronounced
A	ALFA or ALPHA	**AL**-FAH
B	BRAVO	**BRAH**-VOH
C	CHARLIE	**CHAR**-LEE or **SHAR**-LEE
D	DELTA	**DELL**-TAH
E	ECHO	**ECK**-OH
F	FOXTROT	**FOKS**-TROT
G	GOLF	GOLF
H	HOTEL	HOH-**TELL**
I	INDIA	**IN**-DEE-AH
J	JULIETT or JULIET	**JEW**-LEE-**ETT**
K	KILO	**KEY**-LOH
L	LIMA	**LEE**-MAH
M	MIKE	MIKE
N	NOVEMBER	NO-**VEM**-BER
O	OSCAR	**OSS**-CAH
P	PAPA	PAH-**PAH**
Q	QUEBEC	KEH-**BECK**
R	ROMEO	**ROW**-ME-OH
S	SIERRA	SEE-**AIR**-AH
T	TANGO	**TANG**-GO
U	UNIFORM	**YOU**-NEE-FORM or **OO**-NEE-FORM
V	VICTOR	**VIK**-TAH
W	WHISKEY	**WISS**-KEY
X	Xray	**ECKS** RAY
Y	YANKEE	**YANG**-KEY
Z	ZULU	**ZOO**-LOO

Digits/Numbers		
Digit	Spelt	Pronounced
0	ZERO	ZE-RO
1	ONE	WUN
2	TWO	TOO
3	THREE	TREE
4	FOUR	**FOW**-ER
5	FIVE	FIFE
6	SIX	SIX
7	SEVEN	**SEV**-EN
8	EIGHT	AIT
9	NINE	**NIN**-ER

In essence, proper phraseology can be stated as - for every message you send over a radio or landline, there is a standard format that ATC follows.

For example, here is the order of things in the message when first communicating with an aircraft (initial contact):

1. Identification of aircraft. The callsign as we call it can be several different things. The controller can simply say the tail number of the aircraft as in, “N12345” or use one of the following standard methods:

a. Airline Name and Flight Number “THA142 is said THAI One-Forty-Two”

b. Aircraft Manufacturer “Cessna HS-APD”

c. Aircraft Make “Skyhawk HS-APD”

2. Controller’s identification - whatever the control position is - spoken as Facility and position – “Bangkok Approach”

3. Your message! What are you actually trying to say

4. Optionally, the word “over”

NOTE After initial contact with the aircraft you can omit your ID. The aircraft knows who they are talking to at that point.

Aircraft Identification
It is very important that you are able to clearly identify an aircraft when issuing an instruction. Improper use of call signs can result in pilots executing an instruction intended for another aircraft.
Pilots must be certain that aircraft identification is complete and clearly understood before taking action on an ATC clearance. Controllers should not abbreviate call signs of air carrier or other civil aircraft having authorized call signs. Controllers may initiate abbreviated call signs of other aircraft by using the **prefix and the last three digits/letters** of the aircraft identification after initial communications are established.
The pilot may use the abbreviated call sign in subsequent contacts with the controller. When aware of similar/identical call signs, controllers should take action to minimize errors by emphasizing certain numbers/letters, by repeating the entire call sign, by repeating the prefix, or by asking pilots to use a different call sign temporarily. Pilots should use the phrase "VERIFY CLEARANCE FOR (complete callsign)" if doubt exists concerning proper identity.

Civil aircraft pilots should state the aircraft type, model or manufacturer's name, followed by the digits/letters of the registration number. When the aircraft manufacturer's name or model is stated, the prefix "HS" is dropped. For example. "*KING AIR S BRAVO ROMEO GOLF*", "*CITATION PAPA HOTEL LIMA*" (omit "Experimental" after initial contact)

Air carriers and commuter air carriers having ICAO authorized call signs should identify themselves by stating the complete call sign (using group form for the numbers) and the word "heavy" if appropriate. For example, "*UNITED TWENTY-FIVE HEAVY*", "*THAI TWELVE-FOUTRY-SIX*".

Military aircraft use a variety of systems including serial numbers, word call signs, and combinations of letters/numbers. For example "*THAI AIR FORCE 61782*"

Examples of phraseology usage. All Phraseology can be found in ICAO Document 4444 Chapter 12

Number	Statement
10,000	"One zero thousand"
10,500	"One zero thousand fife hundred"

Flight Levels	Statement
FL150	"Flight level one fife zero"
FL340	"Flight level Tree four zero"

Time	Statement
0715Z	"Zero seven one fife" zulu
1724	"One seven two four" zulu

Altimeter Setting (QNH)	Statement
Q1007	"QNH one zero zero seven"
Q1013	"QNH one zero one tree"

Winds	Statement
11015	"Wind one one zero at one fife"
24006G17	"Wind two four zero at six gusts one seven"

Headings	Statement
30 degrees	"Heading zero tree zero"
270 degrees	"Heading two seven zero"

Squawk Codes	Statement
1100	"one one zero zero"
4517	"four fife one seven"

Runways	Statement
01L	"Runway zero one left"
14	"Runway one four"

Frequencies	Statement
119.700	"one one niner decimal seven"
132.250	"One thee two decimal two fife"

Speed	Statement
210	"Two one zero knots"
170	" One seven zero knots

Mach number	Statement
1.5	"Mach one point fife"
0.82	" Mach point eight two"

Controller Coordination

Coordination is a key skill in all air traffic control operations. Properly done, it makes everything flow smoothly and minimizes problems. Poorly done, it makes controlling a chore and increases everyone's workload. 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. Follow locally established procedures and use your best judgment.

Aircraft Handoff

A handoff is simply the transfer of responsibility for control of an aircraft from one controller to another. You may not handoff any aircraft which is in conflict with another. Solve your own problems rather than try to give them to somebody else. Don't accept a handoff with a conflict either. The easiest way to do a handoff is with your radar client's automated handoff feature. Handoffs done this way usually do not require additional chatbox coordination.

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.

In accordance with any requirements of any locally published procedures, you should start the handoff as soon as practical. This keeps you from forgetting about the aircraft and gives the receiving controller time to coordinate any changes before accepting it. 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.

Additional Information can be found on ICAO Document 4444.

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