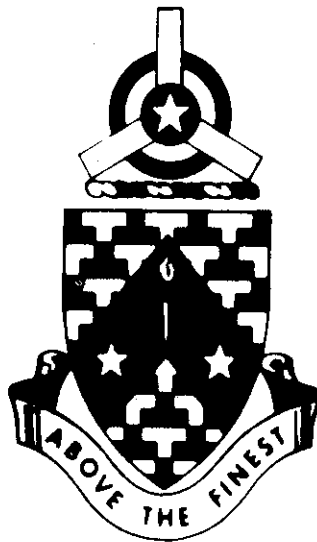


# **PROGRAMED TEXT**

AIR MASS WEATHER (S. E. ASIA)

AM-83



JANUARY 1969

**UNITED STATES ARMY  
PRIMARY HELICOPTER SCHOOL  
FORT WOLTERS, TEXAS**

# PROGRAMED TEXT

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## PROGRAM TEXT

### FILE NO:

AM-83

### PROGRAM TITLE

AIR MASS WEATHER (S.E. ASIA)

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**POI SCOPE:** A general discussion of the weather of Southeast Asia to include the southwest and northeast monsoons and their affect on South Vietnam.

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### INSTRUCTOR REFERENCES:

TM 1-300

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### DATE:

31 March 1968

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### DATE:

February 1969

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**FILE NO:** AM-83

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AIR MASS WEATHER (S.E. ASIA)

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## PREFACE

The chances are very good that you will have the opportunity to fly in Southeast Asia. If you do, the PAVN and Viet Cong are not the only hazards you will encounter. The weather will cause you just as many anxious moments as will the enemy.

Weather in Southeast Asia differs considerably from weather in the United States. Although, the basic phenomena such as clouds, precipitation, and fog are formed in the same way, the overall weather during various seasons of the year is the result of entirely different factors.

This program text is designed to give you a brief insight into the weather in Southeast Asia. Variations will occur depending on your location in Vietnam; but if you know generally what to expect you will be a more effective aviator and will have a better chance of performing your mission successfully in the combat zone.

Start with frame 1 and work each frame in succession. Each frame will usually ask you a question. The correct answer is printed on the top of the next frame. If you were incorrect, turn back and restudy the information before continuing on to the next frame. When you have finished the text, complete the self evaluation exercise. Now begin by studying the performance objectives on page iv.

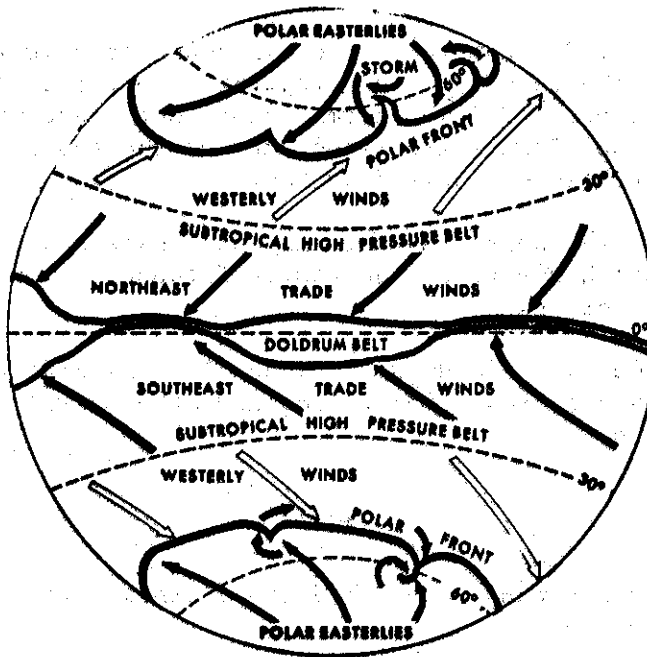
## **PERFORMANCE OBJECTIVES**

You will obtain a general knowledge of Southeast Asia weather and will relate the dry and wet seasons in each part of the country with the proper monsoon season.

You will identify the major flight hazards of the wet and dry seasons and specify procedures to minimize these hazards.

FRAME 1

Southeast Asia is too far south to be affected by the usual cyclonic storms and associated fronts which characterize higher latitude weather. The weather in Southeast Asia is dependent primarily on the position of the intertropical convergence zone (ITCZ). This zone or area of low pressure, which is also known as the Doldrum Belt, is caused by intense heating of the earth's surface by the sun. As the heated air rises it is replaced by air flowing from the high pressure belts at  $30^{\circ}$  N and  $30^{\circ}$  S Latitude. Since the ITCZ moves with the sun, its position is generally north of the equator during the summer and south of the equator during the winter months.



The weather in Southeast Asia is dependent primarily on

- a. the thickness of the doldrum belt.
- b. the characteristics of the air masses and fronts moving across the area.
- ☒ c. the position of the intertropical convergence zone.
- d. the strength of the subtropical high pressure belts.

TURN TO PAGE 3 FOR FRAME 2

FRAME 6

With the exception of the northeast coastal lowlands, the sequence of daily weather over Vietnam normally takes the following pattern during the Southwest Monsoon:

1. MORNING HOURS - Patches of fog and dense stratus with frequent light rain or drizzle in the mountains. Patches of fog and low stratus will form along the rivers and marshlands.
2. MID-DAY - Cumulus clouds begin to develop and gradually grow in size.
3. AFTERNOON AND EVENING - Cumulus clouds increase in height and amount with many showers and thunderstorms occurring throughout the central highlands and southern lowlands. Thunderstorms occur most frequently over the mountains but seldom form solid lines such as the squall lines that are common in the southeastern United States.
4. AROUND MIDNIGHT - Thunderstorms normally dissipate and rain showers cease in most locations; however, thunderstorms frequently continue until after sunrise in the mountains.
5. EARLY MORNING - Cumulus clouds will gradually dissipate until only a few middle and high clouds remain. Fog and stratus will begin to form late in the period.

When flying in mountainous areas of South Vietnam during the southwest monsoon, you should expect

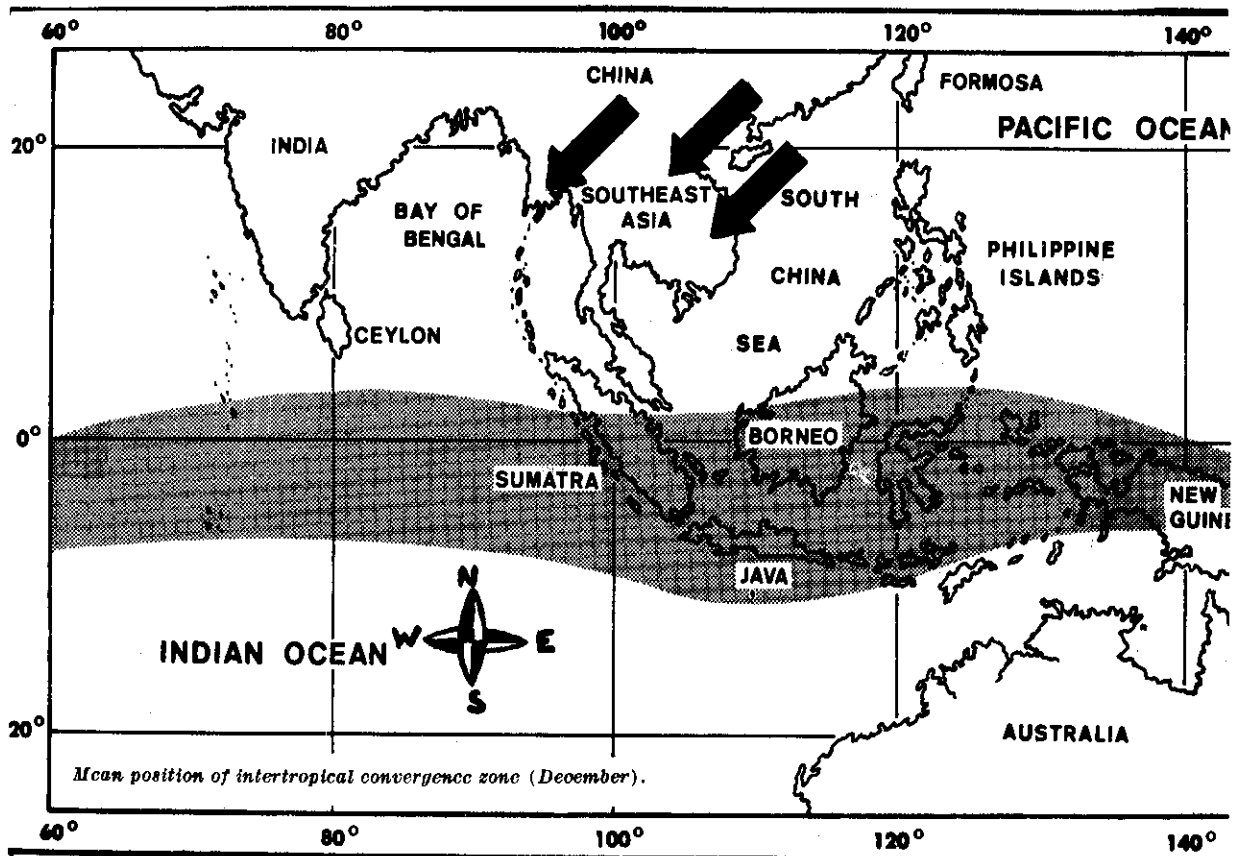
- a. cumulus clouds and thunderstorms between 0200 and 0600 local standard time.
- b. light rain or drizzle during most of the day.
- ☒ c. fog and dense stratus clouds in the morning (daylight) hours.
- d. no thunderstorms after 2300 hours.

TURN TO PAGE 4 FOR FRAME 7.

ANSWER: c. the position of the intertropical convergence zone.

FRAME 2

The position of the ITCZ is south of Southeast Asia during the winter months. This results in a flow of air from the northeast over Vietnam and the rest of Southeast Asia as air flows from the high at  $30^{\circ}$  North latitude to the ITCZ. This flow of air during the winter months is known as the Northeast Monsoon.



The northeast monsoon affects Southeast Asia during the period:

- a. December only.
- b. from December to September.
- c. from June to September.
- (d.) from October to March



ANSWER: c. fog and dense stratus clouds in the morning (daylight) hours

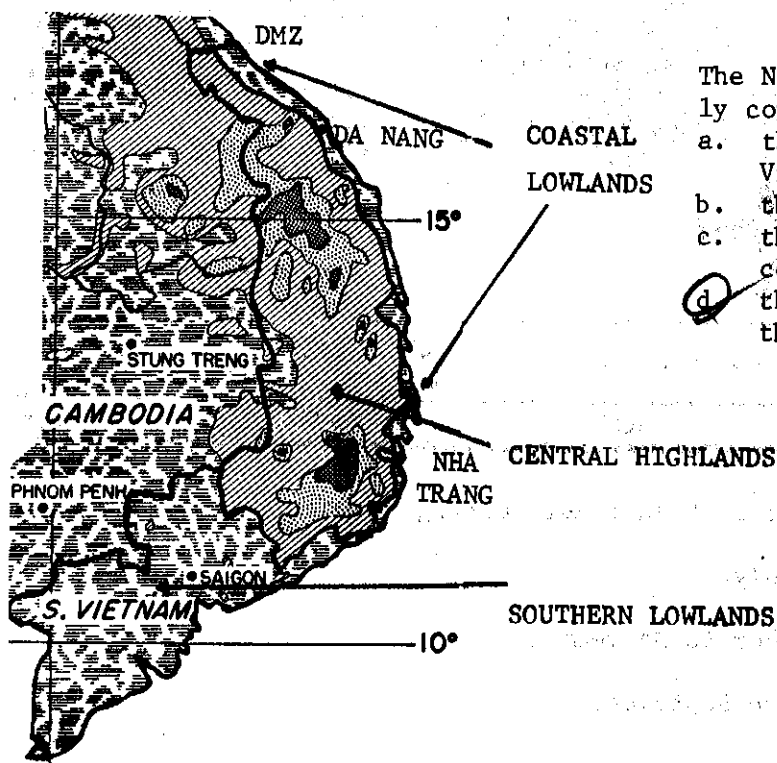
FRAME 7

### The Northeast Monsoon

The Northeast Monsoon begins in Southeast Asia during October and continues until mid-March.

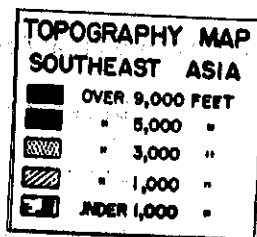
It is relatively colder and dryer than the Southwest Monsoon and with the exception of the eastern coastlands this period is considered to be the dry season in Southeast Asia. The air flow originates in the cold Siberian High and moves south to the South China Sea. This air merges with the warmer western flow from the Western Pacific and arrives over the East Coast of Vietnam with cooler temperatures and high moisture content.

As this moist air reaches the east coast it is lifted over the coastal mountains, clouds form, and considerable precipitation occurs. This is the wet season for the Northeast Coastal Region. Most of the moisture in this northeast flow is dissipated over the east coast and the air arrives over the Central Highlands and Southern Lowlands relatively free of moisture. This air retains cool temperature characteristics of its source region and temperatures over the entire country of Vietnam are lower during this period than during the Southwest Monsoon.



The Northeast monsoon is generally considered to be

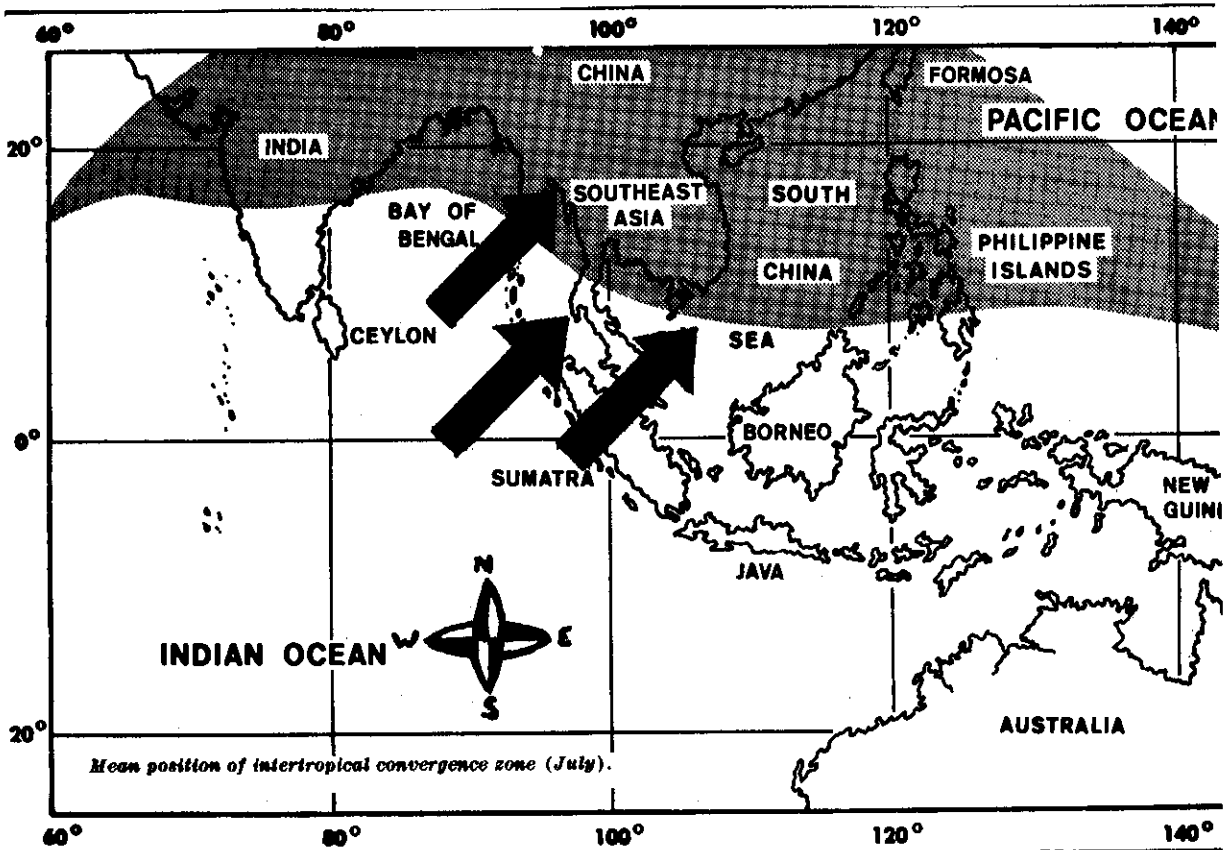
- a. the wet season over most of Vietnam
- b. the wet season in the delta
- c. the dry season in the northeast coast
- ☒ d. the dry season over most of the country



ANSWER: d. October to March

FRAME 3

The Southwest Monsoon begins at the end of May and predominates over Southeast Asia until the end of September. This is the result of the Northward migration of the intertropical convergence zone during the summer months. During this period the ITCZ is located generally North of Vietnam. Air flowing from the high pressure area at 30°South latitude to the ITCZ flows over Vietnam from the Southwest. This flow of air is known as the Southwest Monsoon.



During the southwest monsoon season, the flow of air over Southeast Asia is

- a. directly opposite to the northeast monsoon flow.
- b. towards the southwest.
- c. stronger than at any other season.
- d. Variable depending on local conditions.

ANSWER: d. the dry season over most of the country.

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FRAME 8

During the northeast monsoon precipitation occurs during afternoon and evening thunderstorms. These showers are normally very intense, but are of short duration. Precipitation occurs on more than 15 days per month along the northeast coast between Nha Trang and Quang Tri. In the Central Highlands around Pleiku rainfall is expected on only 1 or 2 days per month and it is not uncommon for this area to go 60 to 90 days without rain. Elsewhere precipitation is observed on 3 to 10 days per month.

Maximum thunderstorm occurrence is along the northeast coast. Over the rest of Vietnam, thunderstorms occur on an average of less than one day per month.

During the northeast monsoon season, you are assigned a flight from Quang Long to Pleiku with passenger stops at Nha Trang and Qui Nhon. Your ETAs are: 1200 Hrs at Nha Trang, 1330 Hrs at Qui Nhon and 1300 Hrs. at Pleiku. You should expect

- a. low clouds and precipitation at all stops.
- b. good flight conditions from Quang Long to Qui Nhon and poor flight conditions from Qui Nhon with thunderstorms in the mountains near Pleiku.
- c. poor flight conditions along the entire coast with showers and thunderstorms. Clear skies in the Pleiku area.
- d. good flight conditions from Quang Long to Nha Trang, possible showers and thunderstorms from Nha Trang to Qui Nhon and clear skies to the Pleiku area.

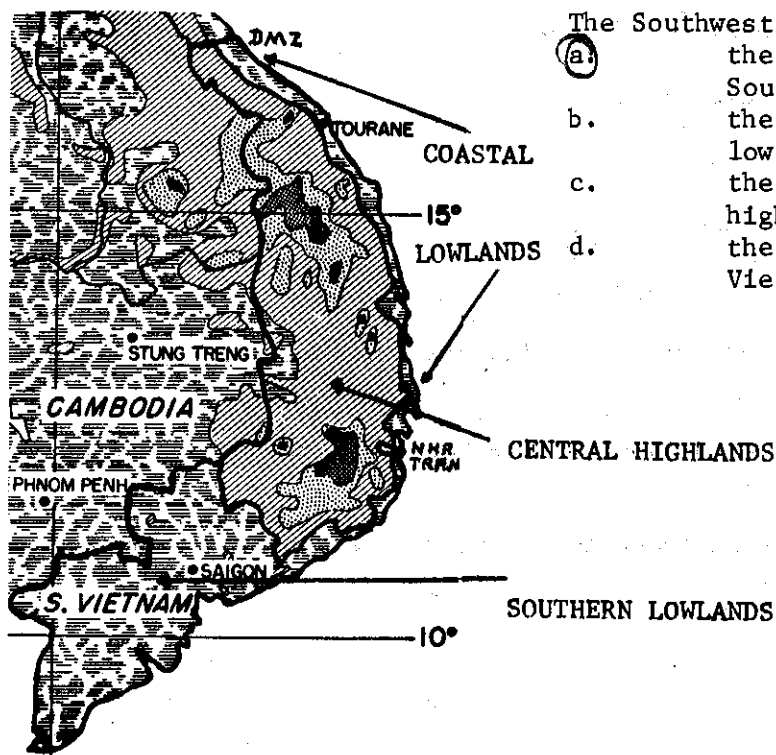
ANSWER: a. directly opposite to the northeast monsoon flow

FRAME 4

### The Southwest Monsoon

The Southwest Monsoon is strongest during the months of July and August. The air that comprises the southwest flow has passed over thousands of miles of tropical oceans as it moves over the Southwestern Pacific and Indian Oceans, and finally across the Gulf of Siam. The air that arrives over the Republic of Vietnam is warm, very moist, and unstable. Additional surface heating and lifting of the air by the mountains will trigger off cumulus clouds and frequent thunderstorms. Therefore, the Southwest Monsoon weather is characterized by frequent showers, high humidities, high temperatures, numerous thunderstorms, and extensive cloudiness in the southern lowlands and the interior highlands.

This season (May to September) is considered the wet season over most of Vietnam. The exception is the coastal lowland region along the northeast coast. This area, from Nha Trang to the DMZ enjoys a relatively dry season during the Southwest Monsoon. This is due primarily to the mountainous terrain in the interior lifting the moist air of the southwest flow and causing it to lose most of its moisture before it reaches the coast.



- The Southwest Monsoon Season is
- (a) the wet season in the Southern Lowland.
  - b. the wet season in the coastal lowlands.
  - c. the dry season in the central highlands.
  - d. the wet season over all of Vietnam

ANSWER: d. good flight conditions from Quang Long to Nha Trang, possible showers and thunderstorms from Nha Trang to Qui Nhon and clear skies to the Pleiku area.

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FRAME 9

During the dry season in any area of South Vietnam, flight procedures are the same as for flying in a high pressure system in the United States. Good visibilities and high ceilings are predominant. The greatest flight hazard is caused by blowing dust, sand, and spray at the termination of an approach. The aviator must be extremely careful when shooting an approach or hovering over areas that may produce excessive dust. In the highlands dust can cause an aircraft to go completely IFR when brought to a hover over heavy traffic areas. This dust and blowing sand also caused clogging of the aircrafts air filters and excessive engine wear and has been the cause of many in-flight engine failures.

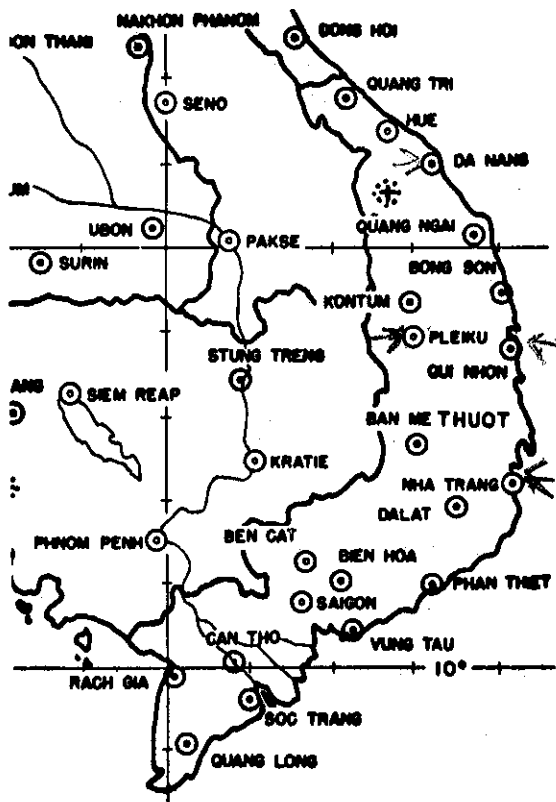
Due to the normally high temperatures, high density altitudes are common over South Vietnam throughout the year. This reduces aircraft performance and is a factor that must be considered during all seasons.

1. The major flight hazard in the Central Highlands during the dry season is
  - a. thunderstorms.
  - b. extensive areas of fog.
  - c. high temperatures.
  - d. dust.
2. Dry season flight conditions are
  - a. ideal in all respects.
  - b. poor in comparison to high pressure areas in the United States.
  - c. poor in comparison to other seasons due to high density altitudes.
  - d. excellent in comparison with wet season conditions.

ANSWER: a. the wet season in the Southern Lowlands.

FRAME 5

The number of days per month with precipitation is quite high during the Southwest Monsoon, averaging fifteen days per month at all locations except along the northeast coast. Many locations in the highlands and along the southern coast of the Republic of Vietnam average twenty to twenty-five days per month of rain during this period. The northeast coast remains relatively dry with precipitation being observed on less than ten days per month. Maximum thunderstorm activity occurs in the southern lowlands, where Vung Tau reports an average of thirteen days a month with thunderstorms. Minimum activity occurs along the northeast coast, where less than one thunderstorm day can be expected over any two month period.



During the southwest monsoon, you would expect maximum precipitation at

- a. Qui Nhon
- b. Da Nang
- c. Pleiku
- d. Nha Trang

TURN BACK TO PAGE 2 FOR FRAME 6

- ANSWER: 1. d. dust.  
2. d. excellent in comparison with wet season conditions.

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FRAME 10

During the wet season, warm front flight procedures should be strictly followed. The areas of low clouds, precipitation, and fog are frequently extensive and navigation aids are at a minimum. The aviator must never become disoriented as to his positive location. Fog and low clouds are a definite hazard to combat operations and all flights during the wet season require careful weather flight planning.

Thunderstorms do not present the same hazard in Vietnam as in the United States as they seldom form in lines and normally can be easily circumnavigated. These storms, of course, should be avoided throughout the year.

The freezing level in South Vietnam is normally above 10,000 feet during all seasons of the year. As this is well above our normal operating altitude, icing is not considered to be a factor for helicopter operations.

The major flight hazard during the wet season in any part of South Vietnam is

- a. lines of thunderstorms.
- b. heavy icing in cumulus clouds.
- c. high gusty surface winds.
- d. extensive areas of fog and low clouds.

THE CORRECT ANSWER IS ON THE TOP OF PAGE 11

NOW COMPLETE THE SELF EVALUATION EXERCISE

ANSWER: d. extensive areas of fog and low clouds.

---

### SELF EVALUATION TEST

1. The wet season over most of Vietnam is during the
  - ☒ a. southwest monsoon.
  - b. southeast monsoon.
  - c. northwest monsoon.
  - d. northeast monsoon.
2. A factor that determines the weather in South Vietnam is
  - a. the season of the year.
  - b. topography.
  - c. the position of the ITCZ.
  - ☒ d. all of the above.
3. In the central highlands, the major flight hazard during the northeast monsoon is
  - a. low ceilings.
  - b. dust.
  - c. extensive areas of fog.
  - ☒ d. thunderstorms.
4. The air that comprises the southwest flow over Vietnam during the summer months (southwest monsoon) is
  - a. warm and dry.
  - b. warm and moist.
  - c. warm and can be moist or dry depending on the month of the year.
  - d. cool in comparison to the northeast monsoon flow.
5. Thunderstorms in South Vietnam are
  - a. more violent than those in the United States.
  - b. generally scattered over the country.
  - c. commonly found in lines.
  - d. very rare.
6. The Intertropical Convergence Zone (ITCZ)
  - a. is located at the equator throughout the year.
  - b. moves from east to west during the northeast monsoon.
  - c. is a major factor in the weather of Southeast Asia.
  - d. all of the above.



7. The area of South Vietnam that receives maximum precipitation during the northeast monsoon is
  - a. the northeast coastal lowlands.
  - b. the Delta.
  - c. the Central Highlands.
  - d. the southern lowlands.
8. Thunderstorms in Vietnam do not present the same hazard as in the United States. This is true because they
  - a. are normally much smaller than stateside thunderstorms.
  - b. are rare over land areas.
  - c. are usually widely scattered.
  - d. are below the freezing level and contain no icing conditions.
9. Dry season flight conditions are
  - a. expected over the Central Highlands during the summer months.
  - b. ideal in all respect.
  - c. limited to two or three weeks each year.
  - d. favorable in comparison with wet season conditions.
10. The Intertropical Convergence Zone is
  - a. an area of low pressure.
  - b. an area of converging winds.
  - c. also known as the Doldrum Belt.
  - d. all of the above.

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ANSWERS TO SELF EVALUATION TEST

1. a
2. d
3. b
4. b
5. b
6. c
7. a
8. c
9. d
10. d

contingent on 3 things seasons  
topography, ITCZ  
S/W monsoon brings rain, Föhn  
fog, clouds, high humidity to  
interior highlands and northern  
lowlands

INVERTED TEMPERATURE  
N/E monsoon (oct - apr) same  
type of weather, but cooler  
because of ocean cold air

air moves toward the ITCZ zone