

2010

***METEOROLOGICAL INSTRUMENT PROFICIENCY***

**OPEN BOOK EXAM**

*Prepared for:*

*1 Canadian Air Division Instrument Check Pilot*

As this is an **OPEN BOOK** examination, the candidate will require the following publications:

- Weather Update and Review 2010
- B-GA-007-001/PT-D01, Air Command Weather Manual, 2008

***INSTRUCTIONS***

Write your unit, SN and name in the space provided.  
Check this examination to ensure it is complete and legible.  
There are 14 pages including this page and charts.  
The examination consists mainly of short answer questions.  
Answer questions as per the current issue of the above publications.  
There are no marks allotted or passing standard set. However, each incorrect response will be corrected to 100% in your presence.

SN \_\_\_\_\_ RANK \_\_\_\_\_

NAME \_\_\_\_\_

UNIT \_\_\_\_\_ DATE \_\_\_\_\_ SCORE \_\_\_\_\_

EXAMINER \_\_\_\_\_

## Part One

(Reference: B-GA-007-001/PT-D01, Air Command Weather Manual, 2008)

1. Circle the conditions that would lead to the numerically lowest air density.
  - a1. High air pressure or
  - a2. Low air pressure
  - b1. Low dew point or
  - b2. High dew point
  - c1. Low temperature or
  - c2. High temperature
  
2. How does solar radiation heat the planet?
  - a. Absorption in clouds and on the ground,
  - b. reflection in clouds and by the ground,
  - c. Both
  
3. State two reasons why water areas warm and cool much more slowly than land areas.  

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4. Nocturnal inversions will be strongest when the sky is clear/cloudy(choose one), the wind is weak/strong(choose one), in or over valleys/slopes (choose one), and over water/land (choose one).
  
5. In high pressure areas, ridges of high pressure and in down slope flow areas, air descends. Generally explain how this affects the formation or dissipation of cloud.  

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6. a. What is the DALR (dry adiabatic lapse rate)? \_\_\_\_\_.
- b. What is the SALR? \_\_\_\_\_
7. As arctic air (temperature  $-12^{\circ}\text{C}$ ) moves over the North Atlantic (temperature  $+2^{\circ}\text{C}$ ) the air is heated/cooled (choose one) from below and becomes stable/unstable (choose one).
8. Choose from the following list all those items which are related to an unstable atmosphere.
- a. Poor visibility near surface
  - b. Showers
  - c. Gusty wind
  - d. Hot tropical air moving northward over the cold Labrador current
  - e. Turbulence
  - f. 1600 hrs local at the Equator
  - g. Layer clouds
9. The wind will blow slower/faster (choose one) around a high or ridge compared to straight isobars with the same pressure gradient.
10. At the same pressure which air mass would have a higher density?
- a. Moist/Cold
  - b. Dry/Cold
  - c. Moist/Warm
  - d. Dry/Warm
11. Cumulonimbus (CB) clouds often grow up to the \_\_\_\_\_.
12. The sky condition changes from CI, to CS, followed by AS, then NS. This indicates the approach of a \_\_\_\_\_.

13. The formation of most precipitation starts with a mixture of \_\_\_\_\_ and \_\_\_\_\_ in cloud.

14. The chances of aircraft condensation trails increases with warmer/colder (choose one) temperature and more humid/less humid (choose one) air.

15. Most icing tends to occur in the temperature range of \_\_\_\_\_, which corresponds to a depth of \_\_\_\_\_, assuming an ISA lapse rate.

16. Clear ice tends to form with conditions of warmer/colder (choose one) sub-freezing temperatures and with larger/smaller (choose one) super cooled water droplets.

17. Smoke and haze will tend to accumulate near the ground when the air is stable/unstable (choose one), whereas sand and particularly dust can be raised high into the atmosphere when the air is stable/unstable (choose one).

18. Name that fog:

- a. Wind blows from northeast into southern Alberta. \_\_\_\_\_
- b. Squadron starts engines on calm morning at -35°C \_\_\_\_\_
- c. Commonly forms in precipitation \_\_\_\_\_
- d. Forms in arctic with very cold air flowing over open ice leads (cracks)  
\_\_\_\_\_
- e. Forms towards morning with clear skies, light winds, humid air \_\_\_\_\_
- f. Tropical air moves over cold Labrador current off East coast \_\_\_\_\_

19. There is an east/west warm front with significantly different winds either side of the front near your operational area. Explain where relative to the front and why very low level wind shear may be experienced.

\_\_\_\_\_  
\_\_\_\_\_

20. What is the relationship between the strength of the horizontal temperature gradient and the magnitude of the associated vertical wind shear. No detailed explanation is required.

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21. True or false? (assume no adjustment of altimeter for each case)

- a. If you fly at an indicated altitude of 3,000' from high pressure to low pressure, your aircraft decreases in altitude. \_\_\_\_\_
- b. When flying at a constant indicated altitude from warmer to colder temperature with MSL pressure the same, your aircraft increases in altitude. \_\_\_\_\_
- c. An aircraft flying at a constant indicated altitude and experiencing starboard drift is descending. \_\_\_\_\_

22. Describe the rotor cloud associated with mountain waves.

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23. What initiates, and then sustains the downdraft in a thunderstorm (two factors)?

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24. List two situations in which triggered lightning is most likely (not the general cause).

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25. What cloud is often associated with the gust front? \_\_\_\_\_

**End of Part One**

## SECTION TWO

(Reference: WU & R)

**SPECI CYWG 081436Z 16016G29KT 1 1/2SM R36/4000VP6000FT/D -TSRA SCT025  
OVC042 18/ REGR WS RWY36 RMK SC4SC4 CB EMBDD=**

**REFER TO THE SPECI ABOVE FOR THE FOLLOWING QUESTIONS.**

1. Decode the RVR report in the SPECI.  
\_\_\_\_\_
2. Decode the group “**REGR**”. \_\_\_\_\_
3. What is the meaning of “18/” in this SPECI? \_\_\_\_\_
4. What is the valid period of the trend forecast found at the end of some European METARs? \_\_\_\_\_
5. Which of the following are true about Canadian automatic weather observing stations?
  - a. Clouds are sensed only above the station
  - b. Clouds are sensed in the entire sky around the station
  - c. Clouds are sensed up to an altitude of 25,000’
  - d. Clouds are sensed up to an altitude of 10,000’
  - e. Cloud amounts (SCT, BKN, etc) are assessed depending on persistence of cloud over the last 10 minutes
  - f. Cloud amounts are assessed depending on persistence of cloud over the last hour.

**TAF EGUN 212020 17010G15KT 9999 SCT100 QNH2951INS**  
**BECMG 2123/2200 18012G18KT 9000 -RA SCT020 BKN030 610307 QNH2938INS**  
**TEMPO 2202/2205 17015G28KT 8000 -RA BKN020**  
**BECMG 2208/2209 22012KT 9999 NSW BKN020 QNH2942INS**  
**BECMG 2212/2213 22010G15KT 9999 SCT020 QNH2943INS**  
**BECMG 2217/2218 22015G25KT WS011/27050KT 9000 -SHRA BKN020 610505**  
**QNH2939INS T08/2214Z T02/2201Z AUTOMATED SENSOR METWATCH**

**REFER TO THE TAF ABOVE FOR THE FOLLOWING QUESTIONS.**

6. Decode the group “**WS011/27050KT**”

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7. What is the lowest ceiling and visibility expected at 22/0700Z? (include units)

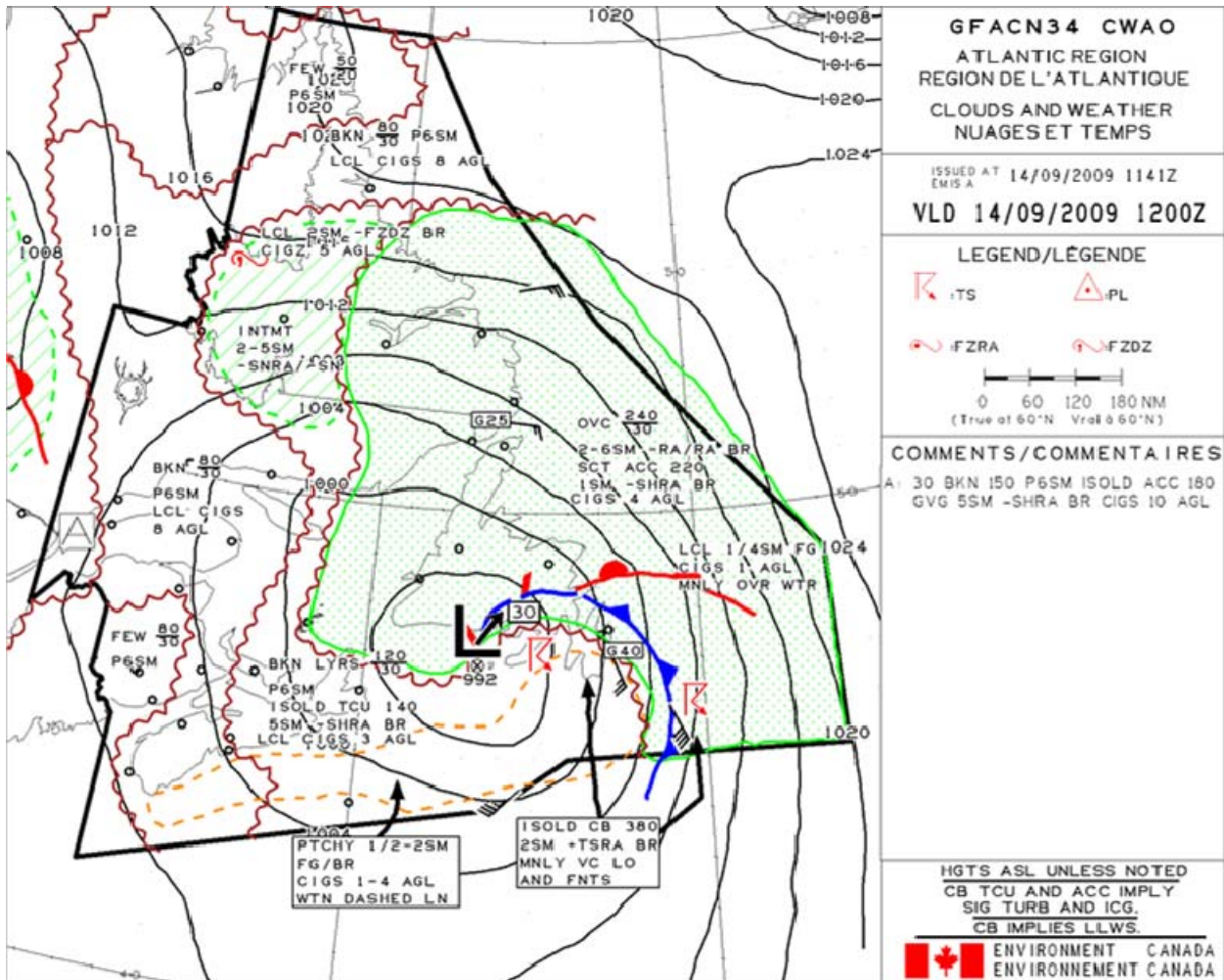
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8. Decode the group “**610307**” (line 2).

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9. What is the purpose of the “**NSW**” on line four?

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**REFER TO THE CLOUDS AND WEATHER GFACN34 (ATLANTIC REGION) VALID 14/09/2009 1200Z ABOVE FOR THE FOLLOWING QUESTIONS.**

10. Decode the cloud description listed at about 50°N/50°W (northeast of Newfoundland).  
 Include bases, tops, amounts and any stated ceilings (all as available).

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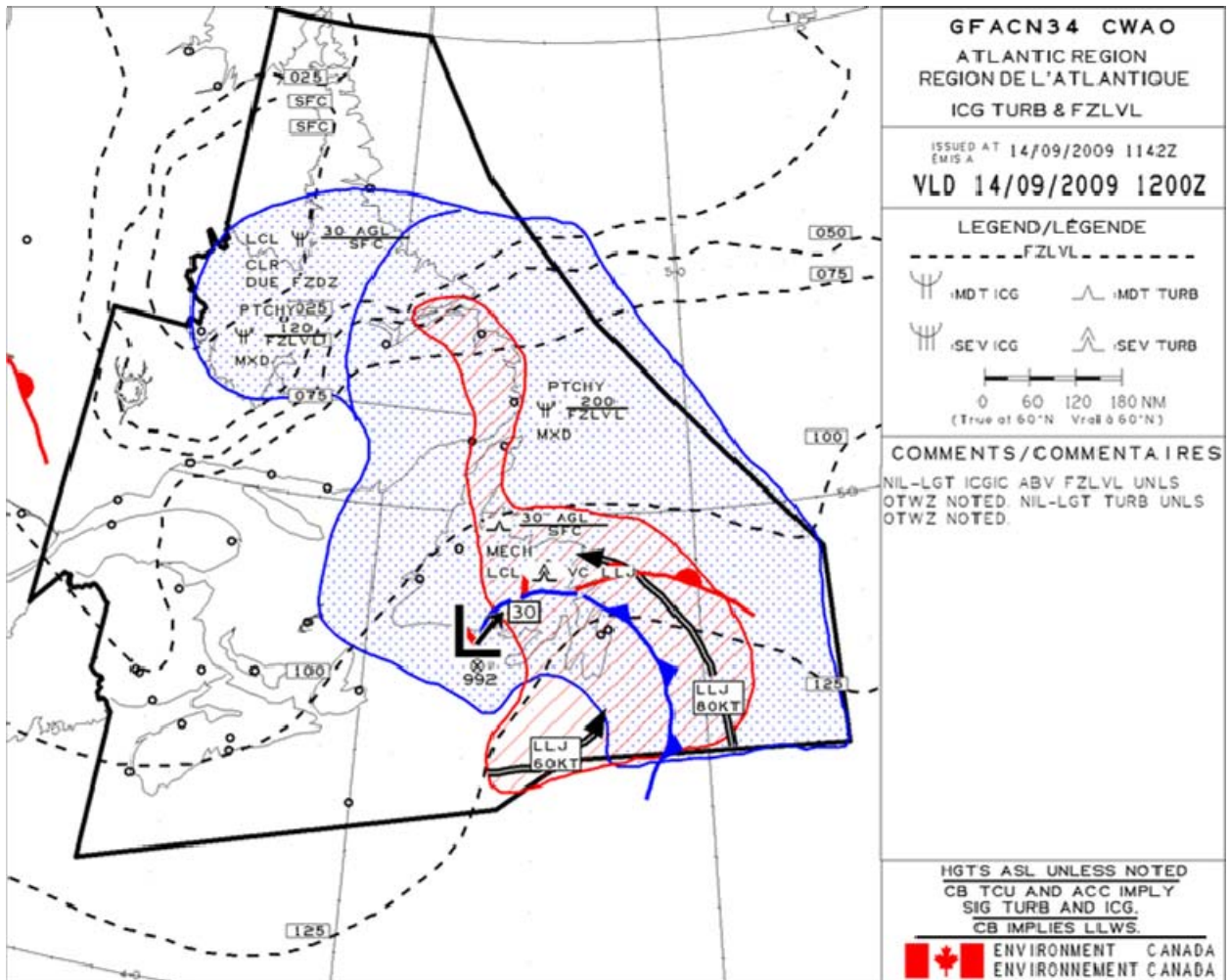
11. What is the direction and speed of the low pressure system? \_\_\_\_\_

12. According to the GFA, what is the weather expected within the dashed line south of Nova Scotia and Newfoundland?

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**REFER TO THE ICING, TURBULENCE AND FREEZING LEVEL GFACN34 ABOVE VALID 14/09/2009 1200Z FOR THE FOLLOWING QUESTIONS.**

13. Completely decode the turbulence statements for central Newfoundland.

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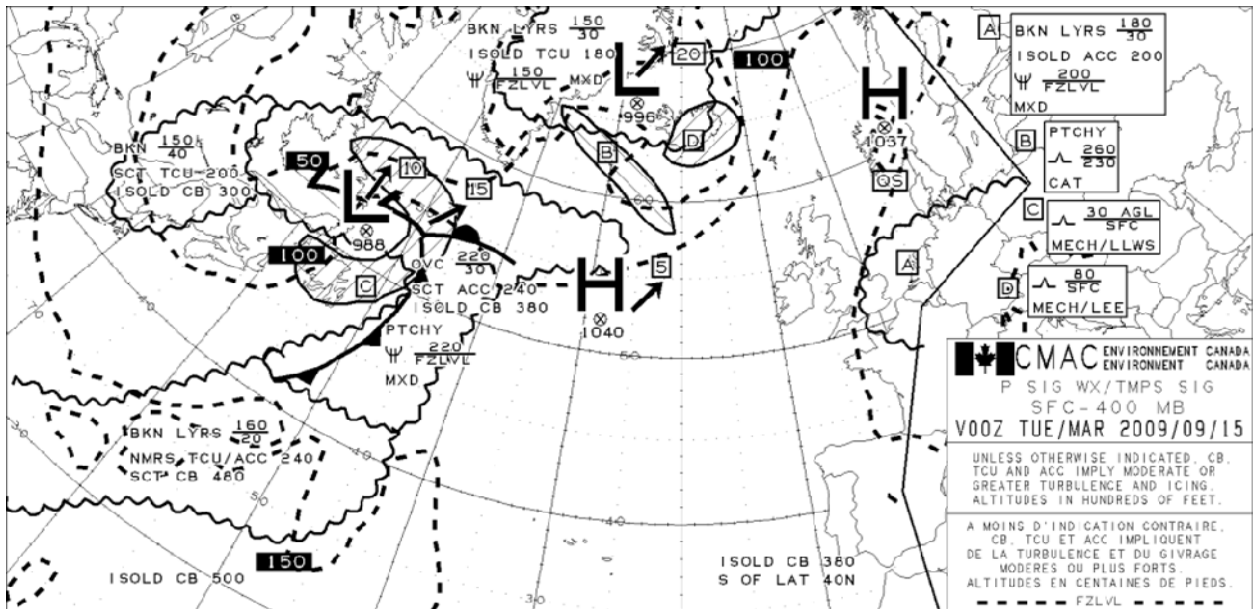
14. Completely decode the icing statement northeast of the Northern tip of Newfoundland to include base (nearest 1,000'), top, type, and intensity. For the position, use the northern tip of Newfoundland.

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FBCN31 KWNO 182015  
 FD1CN1  
 DATA BASED ON 181800Z  
 VALID 190000Z FOR USE 2000-0300Z. TEMPS NEG ABV 24000  
 FT 24000 30000 34000 39000 45000 53000  
 YVR 2675-23 269940 771449 269751 258248 277554

**REFER TO THE HIGH LEVEL WIND DIGITAL FORECAST ABOVE TO ANSWER THE FOLLOWING QUESTION.**

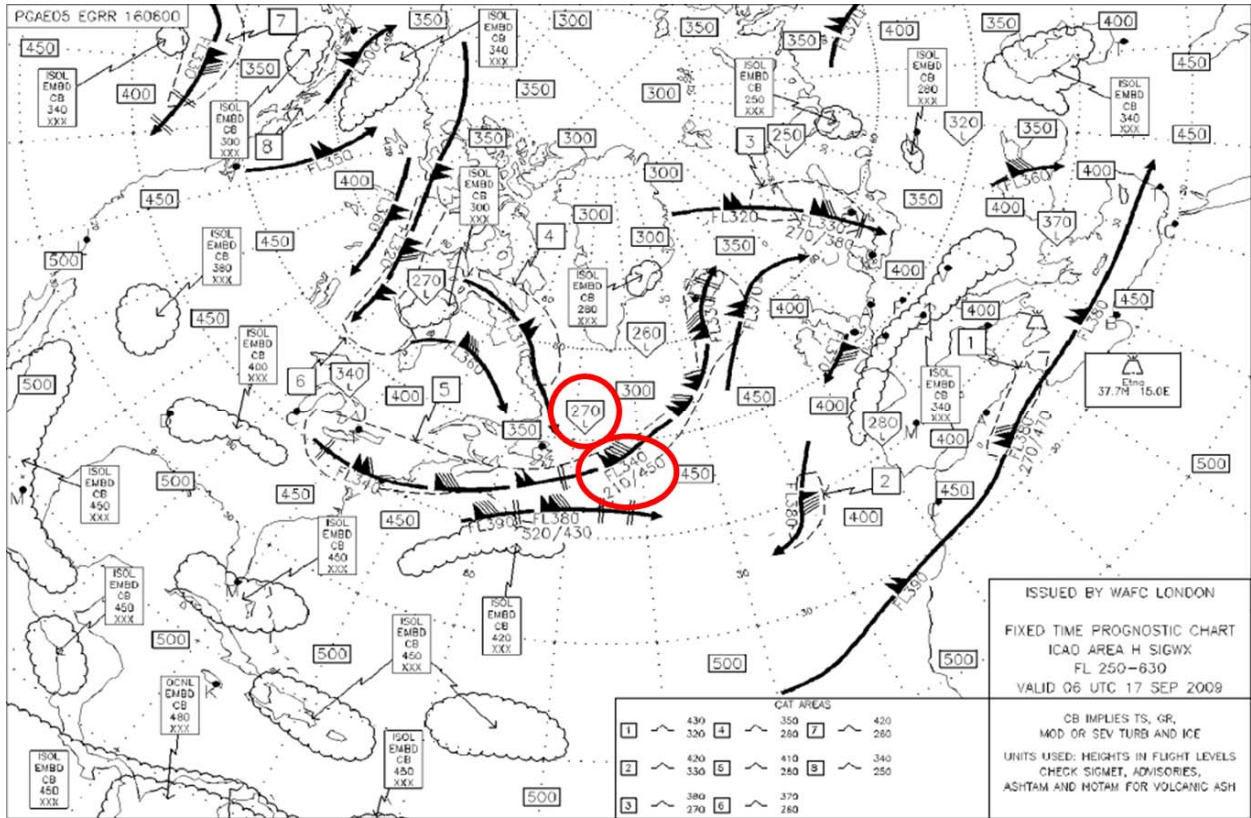
15. Decode the wind/temperature for YVR (Vancouver) for 34,000'. \_\_\_\_\_



**REFER TO THE SIGNIFICANT WEATHER PROG SURFACE-400HPA ATLANTIC REGION ABOVE VALID 00Z TUESDAY 2009/09/15 FOR THE FOLLOWING QUESTIONS**

16. What do the heavy dashed lines on the chart represent? \_\_\_\_\_

17. Decode the hazard for the hatched area over Newfoundland to off the coast of Labrador.  
 \_\_\_\_\_



**REFER TO THE HIGH LEVEL SIG WEATHER CHART FL250-630 ABOVE  
 VALID 06Z 17 SEPT 2009 FOR THE FOLLOWING QUESTIONS.**

18. Decode the wind information contained within a red oval east of Newfoundland. Include speeds, direction, altitudes and what the phenomenon is.

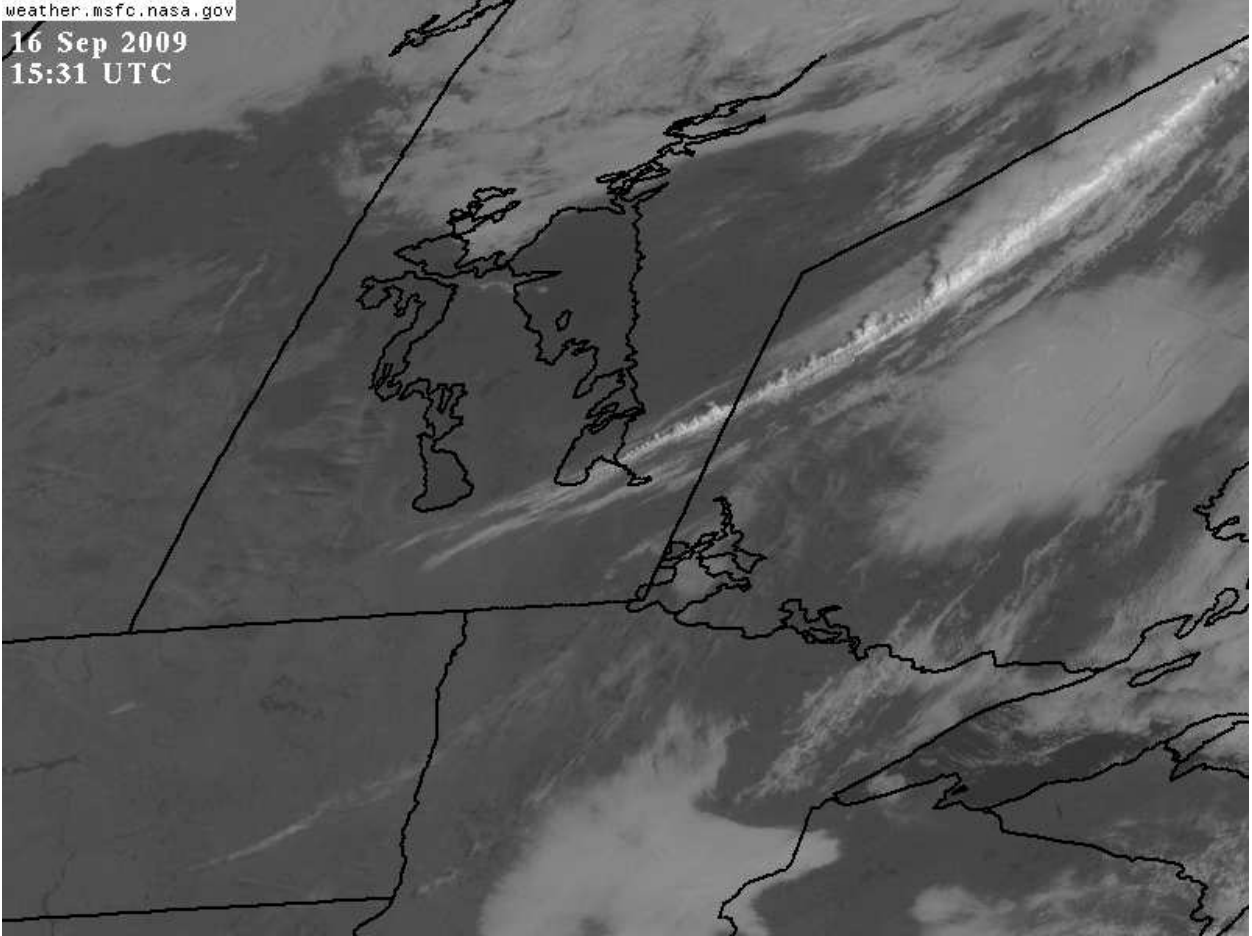
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19. A home plate shaped pentagon is circled nearby. What does it describe and decode as?  
 (three pieces of information)

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weather.msfc.nasa.gov

16 Sep 2009  
15:31 UTC



**REFER TO THE VISUAL SATELLITE IMAGE ABOVE FROM 15:31Z 16 SEPT 2009 (MID MORNING) ABOVE FOR THE FOLLOWING QUESTIONS.**

20. On central part of the visual image, you see a line of irregular looking elements with shadows evident on the northwest side. What are these individual elements? (several answers possible) \_\_\_\_\_

21. On conventional infrared satellite imagery, temperature is sensed and displayed as various grey tones. State comparative differences in tone (anything from black to white) for the following.

- a. Warm earth's surface \_\_\_\_\_
- b. Low cloud \_\_\_\_\_
- c. Middle cloud \_\_\_\_\_
- d. Cumulonimbus cloud top \_\_\_\_\_

22. Why does a high lift rotary wing blade tend to ice up less than a high performance blade?

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23. List three wintertime situations in which icing often occurs.

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24. True or false (within context of volcanic eruptions):

- a. Drifting volcanic ash clouds are detectable by radar\_\_\_\_\_
- b. Drifting ash clouds pose the greatest threat to aircraft\_\_\_\_\_
- c. Gaseous components do not cause long term damage to aircraft\_\_\_\_\_
- d. Within ½ hour, some volcanic cloud columns can rise to over 40,000' \_\_\_\_\_