Ex. 25 – Night Rating

What you will learn:

- ✓ How to safely fly at night.

Why learn this:

- ✓ Expands your options
- ✓ No worries about getting caught after dark
- ✓ Night flying is fun!
  - smoother air
  - less traffic
- ✓ Preparation for more advanced ratings.

Links:

- ✓ You already know how to fly by daylight

- ✓ You have experience flying by reference to the instruments.

Theories and Definitions

- ✓ LEGAL DEFINITIONS & REQUIREMENTS
  - Night Definition, Ratings, and Currency
  - Lights
    - On the ground
    - On the plane
    - In the plane
  - Instruments and Other Equipment Required
  - Weather Minima
- ✓ ELECTRICAL SYSTEM
- ✓ HUMAN FACTORS
  - Night Vision
  - Illusions.

Night Definition, Ratings, Currency

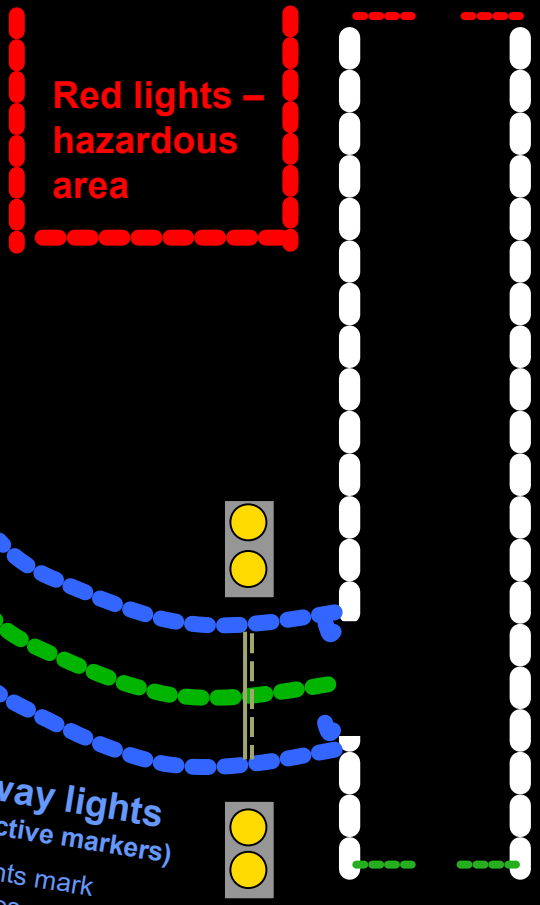
- **When is Night:**
  - whenever the centre of the sun is more than 6° below horizon
  - 25 min. after sunset to 25min. before sunrise

- **Night Rating Requirements:**
  - 5 hours at night dual (incl. 2 hours cross-country)
  - 5 hours at night solo (incl. 10 take-offs, circuits and landings)
  - 10 hours of instrument time (5 can be carried forward from PPL training)

- **Night Currency**
  - CARs set no requirements for solo night currency
  - 5 take-offs and landings at night in the last 6 months required to fly at night with passengers

Lights: On the Ground

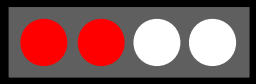
Where can you find descriptions of different aerodrome lights?



White runway lights

(or retro-reflective markers)

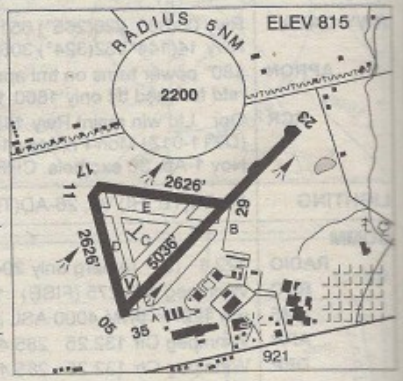
- on each edge of the runway
- at least 75 & most 200 feet apart
- at least 8 markers
- each line at least 1,377 ft
- visible from 2 NM



Lights: On the Ground - CFS

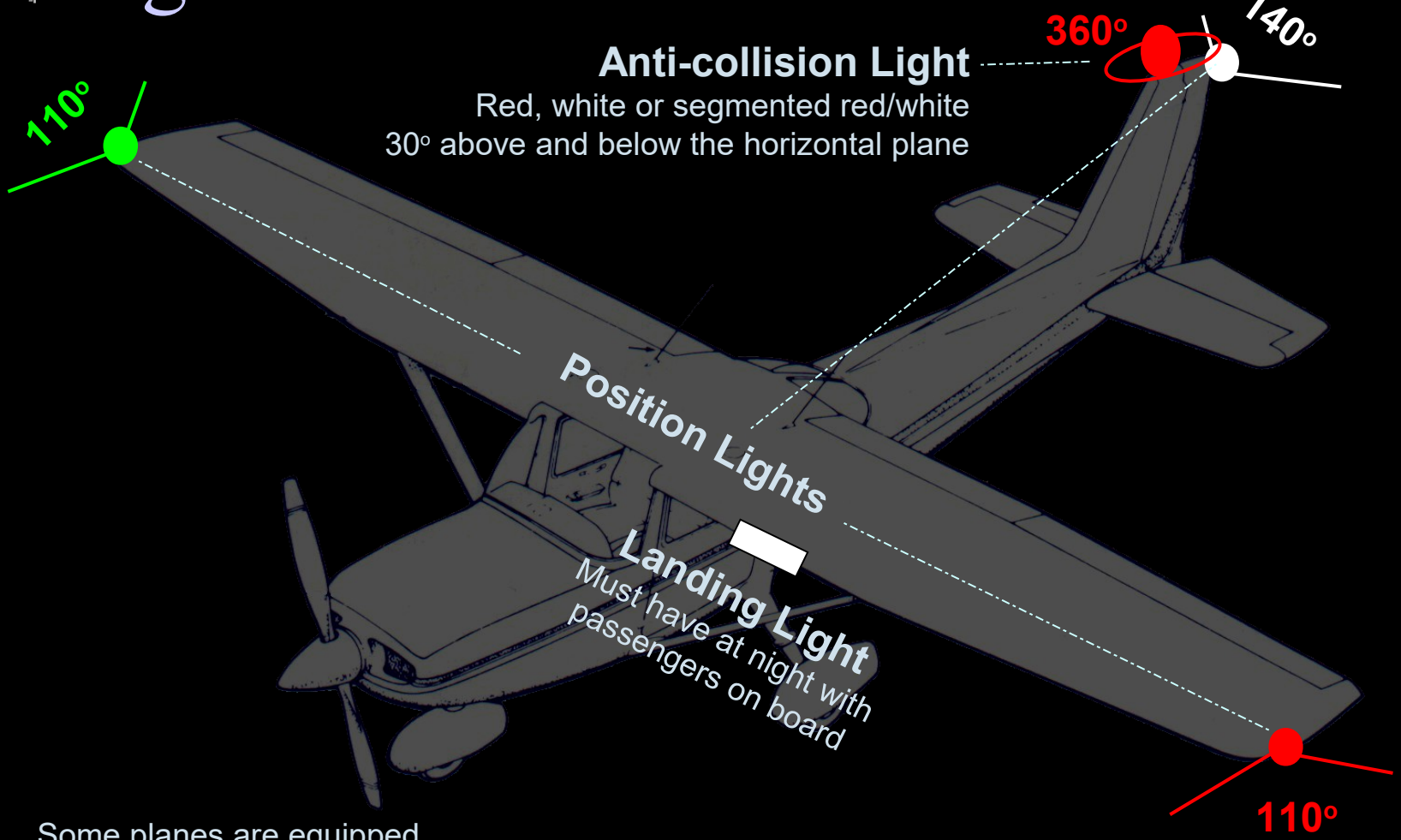
BRANTFORD ON CYFD

REF	N43 07 57 W80 20 29 4WSW 10°W UTC-5(4) Elev 815' VTA A5000 LO6 HI5 CAP
OPR	City 519-753-2521/1241 Reg
PF	B-1,2 C-3,4,5,6
CUST	AOE/15 888-226-7277 PN, 14-22Z‡ Mon-Fri exc hols
FLT PLN FIC	NOTAM FILE CYFD London 866-WXBRIEF (Toll free within Canada) or 866-541-4104 (Toll free within Canada & USA)
SERVICES FUEL OIL S	Svc avbl 14-22Z aprx O/T PN 100LL, JA-1 FSII, SP All 1,2,3,4,5,6
RWY DATA TWY RCR	Rwy 05(053°)/23(233°) 5036x100 asphalt Rwy 11(108°)/29(288°) 2626x100 asphalt Rwy 17(174°)/35(354°) 2626x100 asphalt Twy C, D & E rstd day use only. Opr No w/n maint twys C, D, E.
LIGHTING	05-AS(TE ME) V1, 23-(TE ME), 11-(TE LO), 29-(TE LO), 17-(TE LO), 35-(TE LO) ARCAL-122.825 type K Rwy 05-23 only. Key mike 7 times for RIL Rwy 05.
COMM ATF PAL	 UNICOM ltd hrs O/T tfc 122.825 5NM 3800 ASL Toronto Ctr 119.7 (Hamilton) May not be receivable on ground
NAV NDB	 FD 207 (L) N43 04 24 W80 24 58



LIGHTING	05-AS(TE ME) V1, 23-(TE ME), 11-(TE LO), 29-(TE LO), 17-(TE LO), 35-(TE LO) ARCAL-122.825 type K Rwy 05-23 only. Key mike 7 times for RIL Rwy 05.

Lights: On the Plane



Some planes are equipped with other optional lights, such as dedicated taxi lights or high-intensity strobe lights.

QUICK! Which way is this plane going?

Which way will you turn to avoid it?

Lights: In the Plane

Flashlight accessible to each crew member

Means of illuminating flight instruments

Equipment Needed

Day VFR + Night

M anifold Pressure
O il Temperature Gauge
O il Pressure Gauge

F uel Gauges
A irspeed Indicator
C ompass
T achometer
A ltimeter
R adios (where radio comms req'd)

+

Sensitive, adjustable altimeter
Turn Coordinator
Heading Indicator (unless aerodrome is in sight at all times)

Source of Electrical Energy
Spare Fuses

45 min fuel reserve.

Instruments and Other Equipment

Night VFR

F Fuses
L Landing Light
A Anti collision lights
P Position Lights
S Source of electricity

Weather Minima

CONTROLLED & UNCONTROLLED AIRSPACE

visibility = 3 statute miles

Distances from cloud and distances AGL are the same as for day VFR – do you remember them?

Special VFR minima are the same as for day VFR – do you remember them?

SPECIAL VFR

clear of cloud

1 statute mile

within sight of ground

Electrical System

What equipment in the plane is electrically powered?

- ✓ Except for the engine and flight instruments other than TC, almost everything in the plane is electrically powered
  - lights, radios (turn on ARCAL), flap
- ✓ Electrical system consists of:
  - alternator, powered by the engine
  - battery, charged by the alternator
  - fuses or circuit breakers
- ✓ Alternator failure? Battery will keep supplying charge for about 30 minutes
- ✓ If alternator fails, turn off all non-essential electric equipment and land as soon as practicable

How long after alternator failure will the battery last?

How can you tell when the alternator is not supplying power to the battery?

What is the procedure for popped circuit breaker?

What is the procedure for alternator overvoltage light?

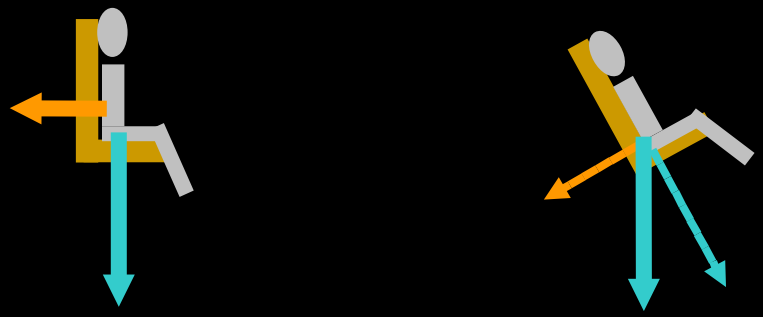
What is the procedure for electrical fire?

Night Vision

- ✓ It takes about 30 minutes for the eye to fully adapt to darkness…
- ✓ … and a momentary flash of light to ruin the adaptation!
  - give yourself time before the flight to get used to the dark
  - try to avoid looking at bright lights inside or outside the cockpit
  - do not use bright lights (landing lights, strobes) when manoeuvering on the ground where they can blind others
- ✓ Even the mildest hypoxia (5000' ASL) affects night vision
  - limit night flight altitude when not using supplemental oxygen
  - don't smoke.

Illusions: Somatogravic

- Our inner ear cannot distinguish between acceleration and pitching up



How can you deal with this illusion?

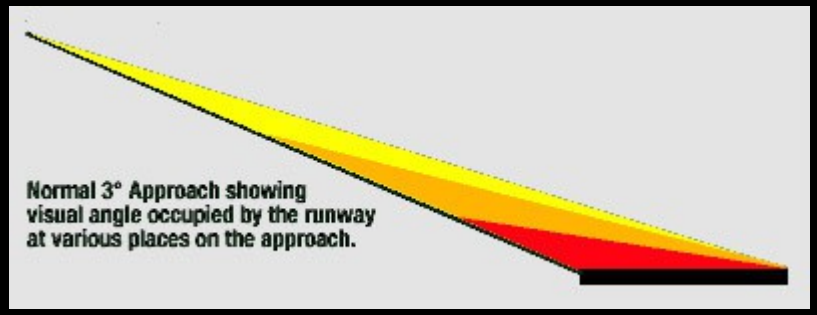
Which instrument can you use to confirm that you are climbing?

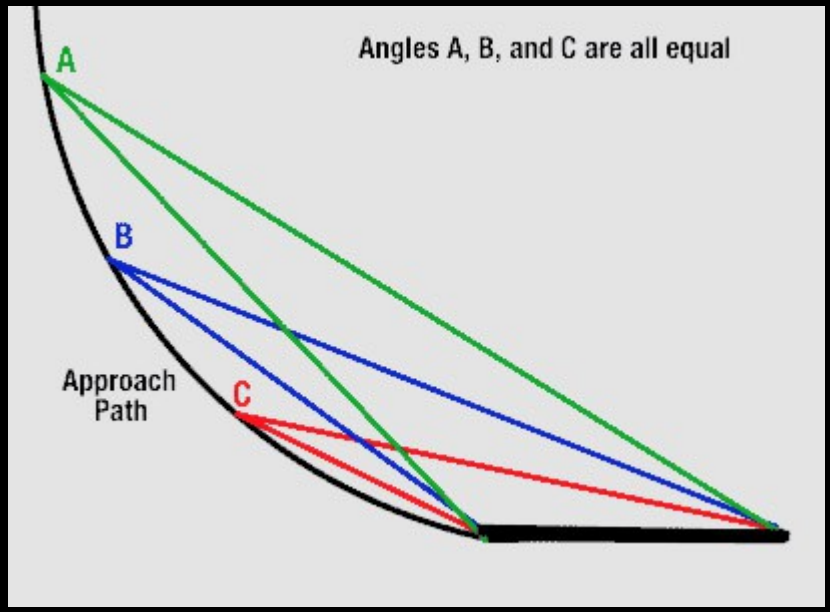
- When accelerating on take-off at night, into a dark sky, pilot may experience the sensation of excessive pitching up

- Lowering the nose will lead to further acceleration which gets misinterpreted as pitching-up and causes the pilot to push the nose further down…

Illusions: Black Hole Approach

- ✓ During long approaches at night over featureless dark terrain pilots tend to keep the visual angle subtended by the runway constant





- ✓ This results in low approaches and potentially landing short of the runway.

Illusions: Black Hole Approach

- Risk factors:
  - long straight-in approaches (illusion disappears at ~2 NM distance)
  - featureless terrain leading up to the airport
  - bright city lights just past the airport (making it appear closer than it is)
  - crisp clear night (haze helps us determine distances to lights and other objects)

- To prevent this illusion
  - do not fly long straight-in approaches at night – use normal circuit pattern
  - use lighting systems that provide vertical guidance on approach (PAPI, VASI etc.), if available.

Illusions

- **FALSE HORIZON:**
  - PROBLEM: lights along the road or moonlight reflecting off waves can appear to be the horizon
  - SOLUTION: use attitude indicator to keep plane level

- **AUTOKINESIS**
  - PROBLEM: staring at a steady light produces the illusion that the light is moving (as the eye momentarily loses focus and then refocuses on the light)
  - SOLUTION: use normal visual and instrument scan, focus slightly to the side of bright lights.

Illusions

- **FLICKER VERTIGO:**
  - PROBLEM: light reflecting off a rapidly rotating propeller flickers, potentially causing nausea or loss of consciousness
  - SOLUTION: avoid looking at the flickering light, change propeller RPM, turn off anti-collision light if necessary for safety, turn away from light source

- **NIGHT MYOPIA**
  - PROBLEM: when eye has nothing to focus on (staring into dark sky/ground), it tend to focus 3-6 feet away
  - SOLUTION: try to look for light sources in the distance, scan the instruments.

Procedures

- ✓ Flight Preparation & Walkaround
- ✓ Taxiing
- ✓ Take-off
- ✓ Approach & Landing.

Flight Preparation & Walkaround

- ✓ **I'M SAFE**

- ✓ Carefully review weather forecast
  - everything is harder at night
  - clouds are hard to see at night

- ✓ During walkaround:
  - ensure all required equipment is present
  - check the lights and electrical system
  - be very thorough – problems that are obvious in daytime may be hard to see in the dark.

Taxiing

- ✓ **Go slower**
  - even familiar airports look very different after dark
  - speed and distances are harder to judge
  - obstructions may be harder to see
- ✓ **Have an airport diagram handy**
- ✓ **Do not hesitate to ask for progressive taxi at an unfamiliar/complicated airport**
- ✓ **Do not use bright lights that can blind other pilots.**

Take-off

- ✓ Use landing light for take-off
- ✓ Use instruments if taking off into dark sky/featureless terrain
- ✓ Post take-off checks:
  - T&P in the green
  - landing light off
  - flaps up
  - VSI in the positive
  - full power.

Approach & Landing

- ✓ Fly a normal circuit: avoid long straight-in approaches
- ✓ Use approach guidance systems (VASI/PAPI), if available
  - same number of red and white lights = just right
  - more RED = too low
  - more WHITE = too high
- ✓ Use distance between runway lights to help judge approach angle
- ✓ Look at the end of the runway on landing to avoid flaring too high.

Considerations

- ✓ Landing light can be used to improve visibility in high-traffic areas…
  - …but keep in mind that landing lights are not meant to be left on for long periods of time
- ✓ With ARCAL Type K you can control aerodrome light brightness. At a controlled field, you can ask the ATC to turn the lights up or down
- ✓ Cross-country considerations:
  - many excellent daytime checkpoints are invisible at night
  - use radio nav aids for cross-checking
  - pay particular attention to MEF, obstacles on charts, and NOTAMs: obstacles and high terrain may be harder to see at night
  - before take-off, make sure the aerodrome you're flying to will be open and will have the services you need.

Examples?

SAFETY

- **VFR crashes are twice as likely to occur at night as during the day:**
  - have higher personal minima for night time than for day flying
  - fly at night with reasonable frequency – or not at all!
  - nights with bright moonlight are best for night cross-countries

- **Ensure lights and electrical system are functioning properly before taking off**

- **Trust your instruments! Know how to switch to the instruments fast if you inadvertently fly into a cloud or turn toward dark, featureless terrain.**

Review

- When is night?
- What lights are required for night flying?
- What other equipment is required for night flying?
- What is the minimum fuel reserve for night flying?
- How can you tell whether the alternator is supplying charge to the battery?
- What is the black hole approach illusion and how do you deal with it?
- What is somatogravic illusion and how can you make sure you are not affected by it on take-off?
- What are the visibility requirements for night flying?
- Is it legal to land on a runway illuminated by a row of 10 white lights, 200 feet apart?

Conclusion

- ✓ Night rating is a fun rating that will expand your options and improve all aspects of your flying (which will translate in better day flying too).

QUESTIONS?