

Ex. 18 – Approach and Landing



What you will learn:

- ✓ How to perform safe and precise approaches and landings, accounting for:
 - your aircraft's performance characteristics
 - wind
 - other traffic (including wake turbulence).

The Circuit Pattern

Take-off

In which direction would you take off?

Normally done @ 500' AAE

Final approach

Why is this plane's nose not aligned with the track it's supposed to fly?

What publication will list special circuit procedures for particular aerodromes?

The wind just changed, introducing a crosswind component. How will the plane's heading change on each circuit leg?

Base leg

Crosswind leg

Downwind leg

- ✓ Circuits normally flown at 1000' AAE
- ✓ Circuits are typically to the left, though there are exceptions
- ✓ It's important to maintain the plane's TRACK (not heading) to ensure a rectangular pattern

Can you think of an exception?

Let's see how much you already know:

- Q Explain “Attitude + Power = Performance”
- Q How do you control airspeed on descent? Altitude?
- Q What effect do flaps have on lift and drag? Why might these effects be desirable for approach and landing?
- Q Why is it important that the plane be aligned with the runway on touch-down? What technique can you use in a crosswind landing to ensure this alignment?
- Q What word must you hear from the air traffic controller before you can land at a controlled airport?
- Q What illusion may you experience turning from downwind to base?

Theories and Definitions:

- ✓ Normal Landings
 - Approach
 - Flare, Touchdown & Roll-out
- ✓ Crosswind Landings
 - Approach
 - Touchdown & Roll-out
- ✓ Landing Performance
 - Head/Tail Wind
 - Density Altitude.

Normal Landings: Approach

✓ Downwind Check

✓ Approach Descent

- 1500-1900 rpm
- 65-70 KIAS
- 20°-40° flaps

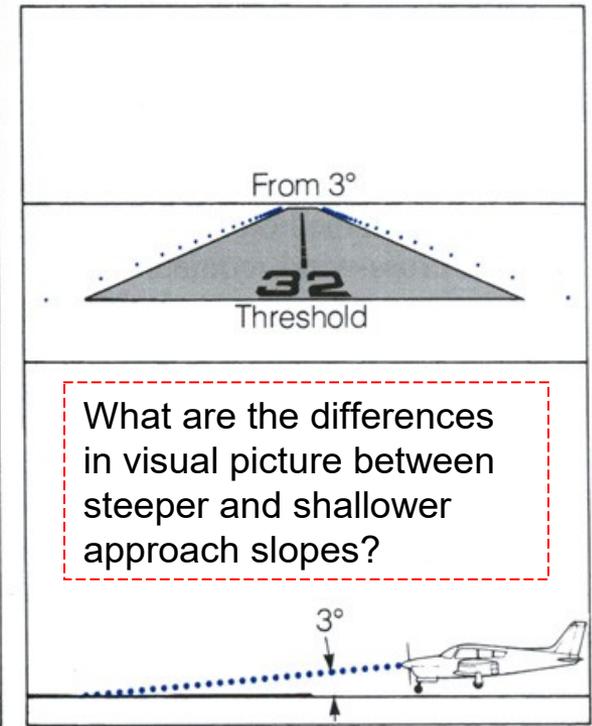
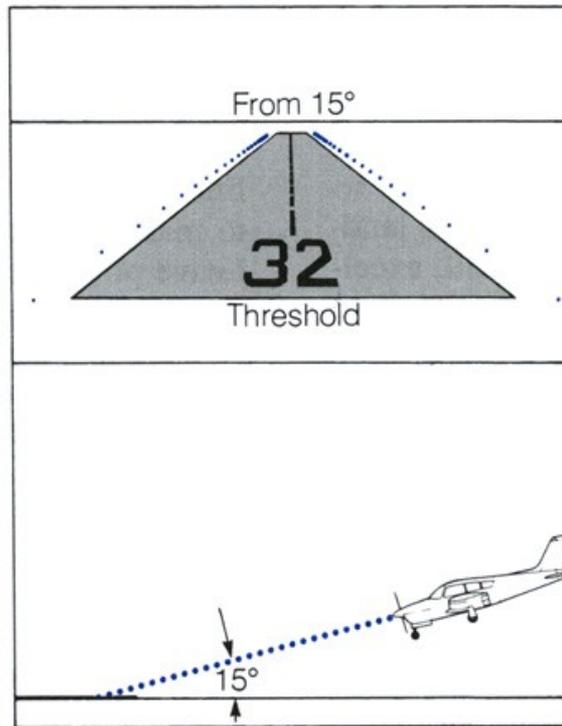
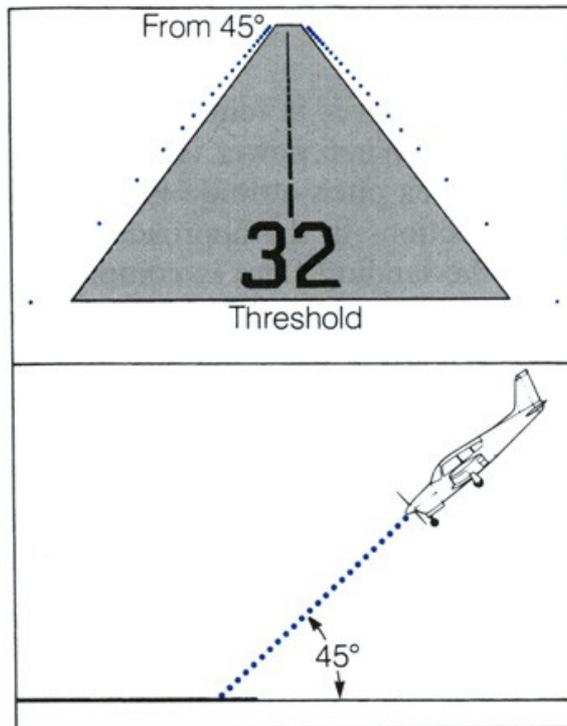
What are the steps to set up an approach descent?

✓ Follow extended runway centerline

How can you compensate for drift?

✓ Hold constant approach slope.

Normal Landings: Judging Approach Slope



What are the differences in visual picture between steeper and shallower approach slopes?

Runway appears tall

Bigger apparent distance between centerline dashes, runway lights etc.

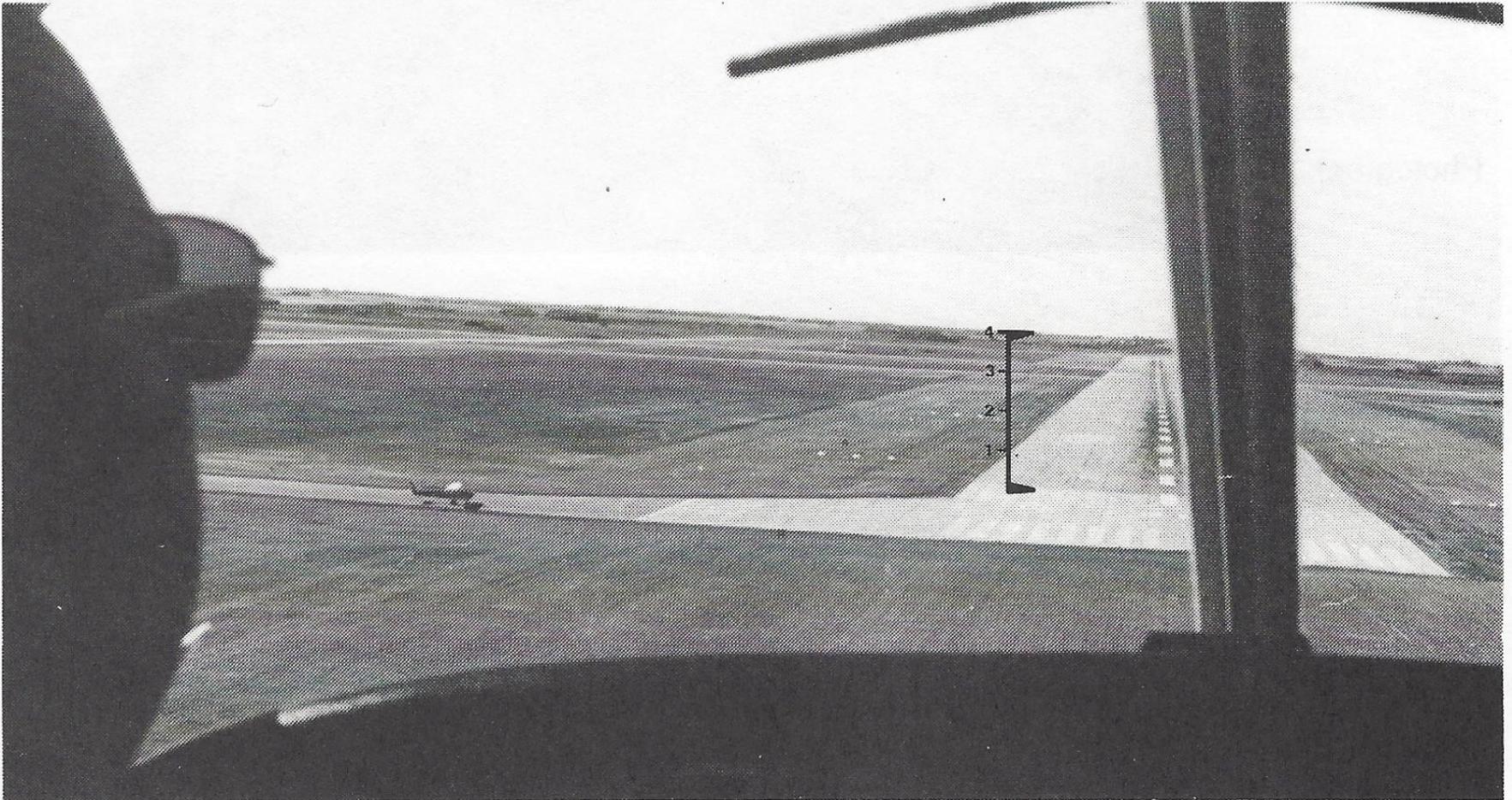
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Runway appears short

Smaller apparent distance between centerline dashes, runway lights etc.

Normal Landings: Judging Approach Slope



Normal Landings: Flare, Touchdown & Roll-out

1. Approach descent

- 65-70 KIAS
- 1500-1900 rpm (gradually reduce to idle by the time you reach the threshold)

2. Begin Flare/ Round-out

- At 15'-30' above ground:
- power idle
 - gentle back pressure to start raising the nose to the cruise attitude

3. Flare/Round-out

- At 2'-3' above ground:
- slightly nose-up attitude
 - try to hold the plane off the ground

4. Touchdown

- main wheels touch down first
- smoothly pull the control column all the way back as the wheels touch down



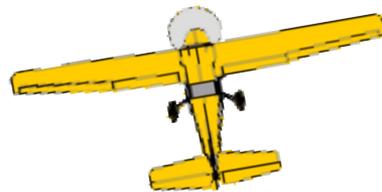
5. Roll-out

- maintain directional control with rudder

Crosswind Landings: Approach



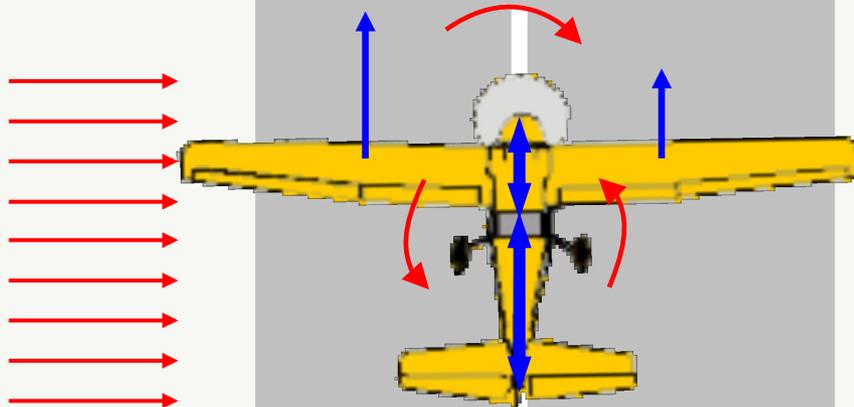
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Flaps in Crosswind Landings

- ✓ Flaps tend to make roll control more difficult and increase turning moment and drifting
- ✓ Flaps may interfere with slipping (in some aircraft, slipping with full flaps is not recommended)
- ✓ After touchdown, flaps make it easier for the wind to get under the wing and complicate directional control
- ✓ In a crosswind, consider using lower flap settings.

Crosswind Landings: Touchdown & Rollout



Effects of Crosswind on Directional Control

1. Weathercocking (plane wants to turn into the wind)
2. Plane is pushed sideways (strain on landing gear)
3. Into-wind wing produces more lift (due to dihedral as well as being more exposed to wind)

Procedures

- ✓ Normal Landing
 - Downwind
 - Base
 - Final
 - Flare, Touch-down, Roll-out
 - Post-Landing

- ✓ Crosswind Landing

- ✓ Overshoot.

Normal Landing: Downwind

- ✓ Fly parallel to the runway (crab into wind as necessary to maintain parallel track)
- ✓ Maintain circuit altitude
- ✓ Downwind checklist

Normal Landing: Base

- ✓ At 45° to the threshold, reduce power (1500-1900 rpm) and turn base

When airspeed is in the white arc, extend flaps

- anticipate nose wanting to rise
- use forward pressure to maintain constant attitude

Descend at ~70 KIAS.

Normal Landing: Final

- ✓ **Turn final to line up with centerline**
- ✓ **Keep constant approach slope, speed**
- ✓ **Aim for desired touchdown point**
 - control altitude with power
 - control airspeed with pitch
- ✓ **Ensure landing clearance** (at controlled airports).

Does “Hotel Zulu Lima, runway 26, number one” constitute a landing clearance?

Normal Landing: Flare, Touchdown & Roll-out

- ✓ Power to idle when runway is made (over the numbers)
- ✓ LOOK AT THE END OF THE RUNWAY
- ✓ At about 15'-30' use gentle backpressure to raise the nose
- ✓ At 2'-3', the plane should be at slight nose-up attitude
- ✓ Try to hold the plane off the ground by gradually raising the nose as the speed "bleeds off"
- ✓ Touch down on main wheels, control column all the way back
- ✓ Maintain directional control with rudder, use appropriate wind inputs for taxiing.

Normal Landing: Post-Landing

- ✓ **Maintain runway centerline**
- ✓ **Turn off the runway when safely able** (normal taxi speed before making turns) – **stop PAST hold short line**
 - **avoid turning off at another runway, unless advised by the ATC**
- ✓ **Post-landing checks**
- ✓ **Further taxi clearance as required.**

Crosswind Landing

- ✓ **Crab into the wind as necessary to track the extended runway centerline**
- ✓ **~200' AGL apply side-slip to keep plane aligned with the centerline**
- ✓ **Touch down on upwind wheel first**
- ✓ **Keep straight with rudder**
- ✓ **Apply taxiing crosswind inputs to control weathercocking.**

Overshoot!

Power

- full power
- carb heat cold

What might be some reasons for conducting an overshoot?

Attitude

- flaps up to 20°
- set up a climb at 55 knots
- wait for +’ve rate of climb on VSI
- flaps up in stages

Why retract some flap right away?

Why not retract all flap at once?

Trim

- retrim airplane

Considerations

- ✓ Touch-and-Goes
- ✓ Wind Shear
- ✓ Wake Turbulence
- ✓ Visual Illusions
- ✓ Recovering from Bad Landings.

Touch-and-Goes

Why would we want to practice those (add power during landing roll-out to turn it into a take-off roll)?

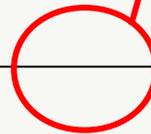
- ✓ **Ensure airplane is under control on landing roll-out**
- ✓ **Flaps up**
- ✓ **Full power**

Wind Shear

- ✓ **Wind shear = violent/abrupt change in wind speed and/or direction**
- ✓ **Increase airspeed when wind shear is likely to be present**

How do you know when it may be present?

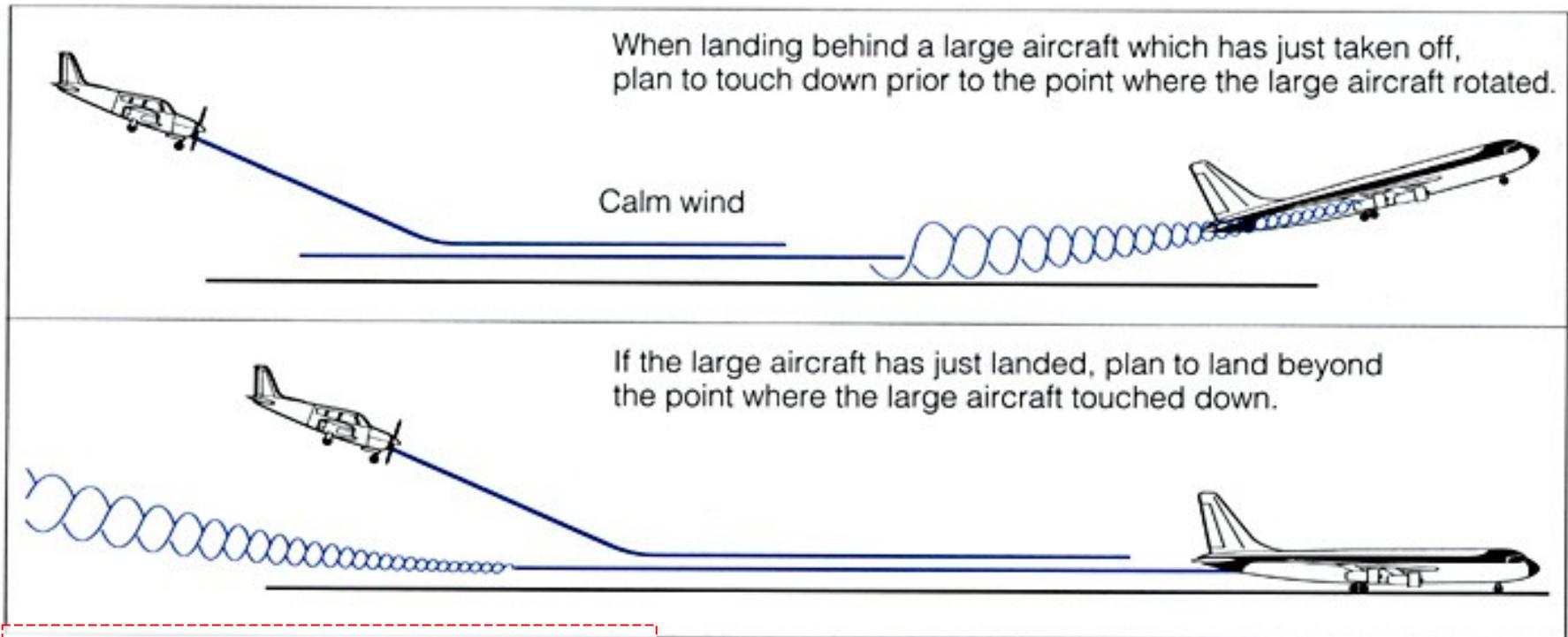
What happens to the plane's airspeed here?



Wake Turbulence

A large aircraft just took off in front of you.
You are on short final. Can you do a touch-and-go?

A large aircraft just landed in front of you.
You are on short final. Can you do a touch-and-go?



How can you plan your approach to avoid wake turbulence of a large aircraft that just took off the same runway you are about to land on?

How can you plan your approach to avoid wake turbulence of a large aircraft that just landed ahead of you?

Visual Illusions

✓ **Sloping runway**

- Upsloping runway → Approach appears steeper than normal → Tendency to fly too flat an approach
- Downsloping runway → Approach appears flatter than normal → Tendency to fly too steep an approach

✓ **Wide/narrow runway**

- Wide runway → Illusion of being lower than you are → Tendency to flare too high
- Narrow runway → Illusion of being higher than you are → Tendency to flare too low

✓ **Rain**

- Illusion of being high → Tendency to fly too low an approach

✓ **Haze**

- Illusion of being far away from the runway → Tendency to maintain excess altitude

✓ **Water or featureless terrain**

What if you normally fly over water?

- Illusion of being high → Tendency to fly too low an approach.

Recovering from Bad Landings



BALLOONING

NOW YOU ARE LOW...

SLOW...

AND GETTING SLOWER!



FLARE TOO HIGH



BOUNCE

Recovery from Bad Landings

- ✓ **Hold control column steady – do NOT push forward!**
- ✓ **If you're not too high (~5' off the ground), wait for the plane to settle back on the runway**
 - **keep in mind that you are getting slower, so larger control movements may be necessary to control descent rate**
- ✓ **If you are higher than that, apply a bit of power and slowly ease nose down**

WHEN IN DOUBT – OVERSHOOT!

Can you overshoot if you already accepted a landing clearance?

SAFETY

- ! Monitor your airspeed throughout the final approach
- ! When in doubt, pull up and go around
- ! Ensure runway free of traffic and obstruction before landing
- ! Controlled aerodrome: ensure landing clearance was issued before landing
- ! Ensure positive control on landing rollout before the “go” of a “touch-and-go”
- ! Visualize and stay away from wake turbulence
- ! Use appropriate recovery techniques (OR OVERSHOOT!)

Conclusion

- ✓ This is the final exercise in the segment of your training concentrating on take-offs, circuits and landings
- ✓ Practice of these exercises leads to your first solo!
- ✓ Mastering the landing is a great confidence-booster: but don't get overconfident
- ✓ In future lessons we will discuss “specialty” landings (for soft/rough and short fields)