



Cessna Aircraft Short & Soft Field Takeoff & Landing Techniques



Objectives / Content



- For short- and soft-field takeoff and landing operations in CAP Cessna aircraft, review:
 - *Standards (from ACS)*
 - *Procedures (from POH/AFM)*
 - *Techniques (from experience)*

 - Risk management and decision-making for short- and soft-field operations



CAUTION

The information in this briefing is intended to serve as a departure point for discussion during CAP flight evaluations and transition training. It should not be interpreted or used as a substitute for the detailed information provided in the Airplane Flying Manual or Pilot's Operating Handbook for each aircraft model.



ACS – Short-Field Takeoff Standards

Task	Task E. Short-Field Takeoff and Maximum Performance Climb (ASEL, AMEL)
References	FAA-H-8083-2, FAA-H-8083-3; POH/AFM
Objective	To determine that the applicant exhibits satisfactory knowledge, risk management, and skills associated with a short-field takeoff, maximum performance climb operations, and rejected takeoff procedures.

Knowledge	The applicant demonstrates understanding of:
PA.IV.E.K1	1. The effects of aircraft configuration.
PA.IV.E.K2	2. The effects of runway surface.
PA.IV.E.K3	3. Takeoff distance.
PA.IV.E.K4	4. Takeoff power.
PA.IV.E.K5	5. Obstruction clearance.
PA.IV.E.K6	6. Wind conditions and effects.
PA.IV.E.K7	7. Minimum safe altitude.
PA.IV.E.K8	8. Density altitude.
PA.IV.E.K9	9. Application of V_x or V_y .
PA.IV.E.K10	10. Emergency procedures during takeoff and climb.

Risk Management	The applicant demonstrates the ability to identify, assess and mitigate risks, encompassing:
PA.IV.E.R1	1. Failure to select the appropriate runway based on wind, pilot capability, and aircraft limitations.
PA.IV.E.R2	2. Exceeding the manufacturer's maximum demonstrated crosswind component.
PA.IV.E.R3	3. Operating from other than a hard surfaced runway.
PA.IV.E.R4	4. Obstruction clearance.
PA.IV.E.R5	5. Climb attitude and stall awareness.
PA.IV.E.R6	6. Windshear.
PA.IV.E.R7	7. Tailwind.
PA.IV.E.R8	8. Wake turbulence.
PA.IV.E.R9	9. Failure to recognize the need to perform a go-around/rejected landing.
PA.IV.E.R10	10. Task management.
PA.IV.E.R11	11. Low altitude maneuvering.
PA.IV.E.R12	12. Wire strikes.
PA.IV.E.R13	13. Obstacles on the departure paths.
PA.IV.E.R14	14. Recognition of need for rejected takeoff and identification of takeoff abort criteria.
PA.IV.E.R15	15. Strategies for handling engine failure during takeoff and climb, including recognition that climb at V_x (versus V_{xopt}) may result in loss of directional control if an engine fails.
PA.IV.E.R16	16. Criticality of takeoff distance available.
PA.IV.E.R17	17. An engine failure after takeoff.
PA.IV.E.R18	18. Failure to adhere to sterile cockpit requirement.

Skills	The applicant demonstrates the ability to:
PA.IV.E.S1	1. Verify proper aircraft configuration.
PA.IV.E.S2	2. Verify ATC clearance and no aircraft is on final before crossing the hold line.
PA.IV.E.S3	3. Ensure the aircraft is on the correct takeoff runway.
PA.IV.E.S4	4. Determine wind direction with or without visible wind direction indicators.
PA.IV.E.S5	5. Calculate the crosswind component and determine if it is beyond the pilot ability or aircraft capability.
PA.IV.E.S6	6. Position the flight controls for the existing wind conditions.
PA.IV.E.S7	7. Clear the area, taxi into takeoff position utilizing maximum available takeoff area and align the airplane on the runway center line.
PA.IV.E.S8	8. Apply brakes (if appropriate), while configuring aircraft power setting to achieve maximum performance.
PA.IV.E.S9	9. Confirm takeoff power prior to brake release (if appropriate) and proper engine and flight instrument indications prior to rotation.
PA.IV.E.S10	10. Rotate and lift-off at the recommended airspeed, and accelerate to the recommended obstacle clearance airspeed or V_x .
PA.IV.E.S11	11. Establish a pitch attitude that will maintain the recommended obstacle clearance airspeed, or $V_x +10/-5$ knots, until the obstacle is cleared, or until the airplane is 50 feet above the surface.
PA.IV.E.S12	12. After clearing the obstacle, establish the pitch attitude for V_y , accelerate to V_y , and maintain $V_y +10/-5$ knots, during the climb.
PA.IV.E.S13	13. Retract landing gear and flaps after a positive rate of climb has been verified or in accordance with aircraft manufacturer's guidance.
PA.IV.E.S14	14. Maintain takeoff power and $V_y +10/-5$ knots to a safe maneuvering altitude.
PA.IV.E.S15	15. Maintain directional control and proper wind drift correction throughout the takeoff and climb.
PA.IV.E.S16	16. Comply with noise abatement and published departure procedures.
PA.IV.E.S17	17. Complete the appropriate checklist.
PA.IV.E.S18	18. Comply with manufacturer's recommended emergency procedures related to the takeoff sequence.
PA.IV.E.S19	19. Utilize runway incursion avoidance procedures.



Short-Field Procedures (POH/AFM)

For Your Specific Model Aircraft

Takeoff	Landing



Short Field Takeoff Techniques

- Use all available runway for takeoff
- Set flaps per the POH
- Use a Static Takeoff
- Hold the brakes while setting takeoff power with yoke slightly aft of neutral to keep weight off nose wheel
- After brake release, vary elevator control as necessary to maintain slightly nose high sight picture
- Approaching rotation speed, the airplane should be firmly and smoothly lifted off the surface to a pitch attitude that will result in reaching obstacle clearance speed at 50' AGL
- The landing gear and flaps should remain in takeoff position until clear of obstacles (or as recommended by the manufacturer)



Short Field Takeoff Common Errors

- Improper use of flaps
- Failure to use all available runway
- Lift-off or rotation premature
- Improper application of power
- Poor directional control on takeoff
- Brakes improperly used during takeoff
- Failure to firmly rotate at the specified rotation speed and achieve Obstacle Clearance Speed at 50' AGL per the POH
- Failure to maintain appropriate climb speed



ACS – Short-Field Landing Standards

Task	Task F. Short-Field Approach and Landing (ASEL, AMEL)
References	FAA-H-8083-2, FAA-H-8083-3; POH/AFM
Objective	To determine that the applicant exhibits satisfactory knowledge, risk management, and skills associated with a short-field approach and landing with emphasis on proper use and coordination of flight controls.

Knowledge	The applicant demonstrates understanding of:
PA.IV.F.K1	1. Landing distance.
PA.IV.F.K2	2. Hazards of other than a hard surfaced runway.
PA.IV.F.K3	3. Obstruction clearance.
PA.IV.F.K4	4. Stabilized approach.
PA.IV.F.K5	5. Energy management.
PA.IV.F.K6	6. Wind conditions and effects.
PA.IV.F.K7	7. Density altitude.
PA.IV.F.K8	8. Emergency procedures during approach and landing.
PA.IV.F.K9	9. Land and hold short operations.

Risk Management	The applicant demonstrates the ability to identify, assess and mitigate risks, encompassing:
PA.IV.F.R1	1. Failure to select the appropriate runway based on wind, pilot capability, and aircraft limitations.
PA.IV.F.R2	2. Exceeding the manufacturer's maximum demonstrated crosswind component.
PA.IV.F.R3	3. Operating from other than a hard surfaced runway.
PA.IV.F.R4	4. Obstruction clearance.
PA.IV.F.R5	5. Climb attitude and stall awareness.
PA.IV.F.R6	6. Wind shear avoidance.
PA.IV.F.R7	7. Tailwind.
PA.IV.F.R8	8. Wake turbulence.
PA.IV.F.R9	9. Task management.
PA.IV.F.R10	10. Low altitude maneuvering.
PA.IV.F.R11	11. Collision avoidance, scanning, obstacle and wire strike avoidance.
PA.IV.F.R12	12. Failure to follow the right-of-way rules.
PA.IV.F.R13	13. Obstacles on approach and landing paths.
PA.IV.F.R14	14. Failure to recognize the need for a go-around/rejected landing.
PA.IV.F.R15	15. Low altitude stall/spin.
PA.IV.F.R16	16. Land and hold short operations (LAHSO).
PA.IV.F.R17	17. Failure to adhere to sterile cockpit requirement.

Skills	The applicant demonstrates the ability to:
PA.IV.F.S1	1. Ensure the aircraft is aligned with the correct/assigned runway.
PA.IV.F.S2	2. Scan the landing runway/area for possible obstructions for landing.
PA.IV.F.S3	3. Complete the appropriate approach and landing checklist.
PA.IV.F.S4	4. Consider the wind conditions, landing surface and obstructions to select a suitable touchdown point.
PA.IV.F.S5	5. Establish the recommended approach and landing configuration and airspeed, and adjust pitch attitude and power as required.
PA.IV.F.S6	6. Maintain a stabilized approach and recommended airspeed, or in its absence, not more than 1.3 V _{SO} , with wind gust factor applied +10/-5 knots or as recommended by aircraft manufacturer to a safe maneuvering altitude.
PA.IV.F.S7	7. Make smooth, timely, and correct control application during the round out and touchdown.
PA.IV.F.S8	8. Touch down smoothly at an appropriate airspeed.
PA.IV.F.S9	9. Touch down within the available runway, at or within 200 feet beyond the specified point, threshold markings or runway numbers, with no side drift, minimum float, and with the airplane's longitudinal axis aligned with and over the runway center line/landing path.
PA.IV.F.S10	10. Maintain crosswind correction and directional control throughout the approach and landing sequence, as required.
PA.IV.F.S11	11. Execute a safe and timely go-around decision when the approach cannot be made within the tolerances specified above or for any other condition that may result in an unsafe approach or landing.
PA.IV.F.S12	12. Apply brakes, as necessary, to stop in the shortest distance consistent with safety.
PA.IV.F.S13	13. Utilize after landing runway incursion avoidance procedures.



Short Field Landing Techniques

- In smooth air, use the airspeed and flap setting recommended in the POH with enough power to control glide path
- In turbulent air, slightly higher airspeeds should be used
- Once clear of obstacles, smoothly reduce power and maintain airspeed by lowering the nose
- Touchdown should be made on the main wheels first with the power off
- Immediately after touchdown, lower the nose and apply heavy braking as required (simulate heavy braking for training)
- For maximum brake effectiveness, retract flaps and apply maximum brake pressure without sliding the tires

(Recommend not reconfiguring flaps until clear of runway to reduce risk of loss of control)



Short Field Landing Common Errors

- Required landing distance exceeds available runway length
- Poor airspeed control
- Landing configuration established late
- Power control and monitoring inadequate
- Unstable approach
- Improper use of flaps
- Failure to trim properly
- Ignoring checklist
- Hard impact or bounce at touchdown
- Excessive brake application
- Go-around situation not recognized



Short Field Landing Errors





Short Field Landing Errors





Short Field Landing Errors





ACS – Soft-Field Takeoff Standards

Task	Task C. Soft-Field Takeoff and Climb (ASEL)
References	FAA-H-8083-2, FAA-H-8083-3; POH/AFM
Objective	To determine that the applicant exhibits satisfactory knowledge, risk management, and skills associated with a soft-field takeoff, climb operations, and rejected takeoff procedures.

Knowledge	The applicant demonstrates understanding of:
PA.IV.C.K1	1. The importance of weight transfer from wheels to wings.
PA.IV.C.K2	2. P factor in turning tendencies.
PA.IV.C.K3	3. The effects of aircraft configuration.
PA.IV.C.K4	4. The effects of runway surface.
PA.IV.C.K5	5. Takeoff distance.
PA.IV.C.K6	6. Takeoff power.
PA.IV.C.K7	7. Wind conditions and effects.
PA.IV.C.K8	8. Density altitude.
PA.IV.C.K9	9. Application of V_x or V_y .
PA.IV.C.K10	10. Emergency procedures during takeoff and climb.
PA.IV.C.K11	11. Hazards of other than a hard surfaced runway.

Risk Management	The applicant demonstrates the ability to identify, assess and mitigate risks, encompassing:
PA.IV.C.R1	1. Failure to select the appropriate runway based on wind, pilot capability, and aircraft limitations.
PA.IV.C.R2	2. Exceeding the manufacturer's maximum demonstrated crosswind component.
PA.IV.C.R3	3. Operating on other than a hard surfaced runway.
PA.IV.C.R4	4. Windshear.
PA.IV.C.R5	5. Tailwind.
PA.IV.C.R6	6. Wake turbulence.
PA.IV.C.R7	7. Failure to recognize the need to perform a go-around/rejected landing.
PA.IV.C.R8	8. Task management.
PA.IV.C.R9	9. Low altitude maneuvering.
PA.IV.C.R10	10. Wire strikes.
PA.IV.C.R11	11. Obstacles on the departure path.
PA.IV.C.R12	12. Rejected takeoffs and failure to identify a takeoff abort point.
PA.IV.C.R13	13. An engine failure during takeoff and climb.
PA.IV.C.R14	14. Failure to use a soft-field takeoff technique on a other than hard surfaced runway.
PA.IV.C.R15	15. Takeoff distance available.
PA.IV.C.R16	16. Failure to adhere to sterile cockpit requirement.

Skills	The applicant demonstrates the ability to:
PA.IV.C.S1	1. Verify ATC clearance and no aircraft is on final before crossing the hold line.
PA.IV.C.S2	2. Ensure the aircraft is properly configured.
PA.IV.C.S3	3. Ensure the aircraft is on the correct takeoff runway.
PA.IV.C.S4	4. Ascertain wind direction with or without visible wind direction indicators.
PA.IV.C.S5	5. Calculate the crosswind component and determine if it is beyond the pilot ability or aircraft capability.
PA.IV.C.S6	6. Position the flight controls for the existing wind conditions to maximize lift as quickly as possible.
PA.IV.C.S7	7. Clear the area, taxi into the takeoff position and align the airplane on the runway center line without stopping while advancing the throttle smoothly to takeoff power.
PA.IV.C.S8	8. Confirm takeoff power, and proper engine and flight instrument indications prior to rotation.
PA.IV.C.S9	9. Establish and maintain a pitch attitude that will transfer the weight of the airplane from the wheels to the wings as rapidly as possible.
PA.IV.C.S10	10. Lift-off at the lowest possible airspeed consistent with safety and remain in ground effect while accelerating to V_x or V_y , as appropriate.
PA.IV.C.S11	11. Establish a pitch attitude for V_x or V_y , as appropriate, and maintain selected airspeed +10/-5 knots during the climb.
PA.IV.C.S12	12. Retract landing gear and flaps after a positive rate of climb has been verified or in accordance with aircraft manufacturer's guidance.
PA.IV.C.S13	13. Maintain takeoff power and $V_y +10/-5$ knots to a safe maneuvering altitude
PA.IV.C.S14	14. Maintain directional control and proper wind drift correction throughout the takeoff and climb.
PA.IV.C.S15	15. Comply with noise abatement and published departure procedures.
PA.IV.C.S16	16. Complete the appropriate checklist.
PA.IV.C.S17	17. Comply with manufacturer's recommended emergency procedures related to the takeoff sequence.



Soft-Field Procedures (POH/AFM)

For Your Specific Model Aircraft

Takeoff	Landing



Soft Field Takeoff Techniques

- Taxi on soft surfaces with full aft yoke
- Set flaps per the POH
- Use a rolling takeoff (do not stop while setting takeoff power) with yoke slightly aft of neutral to keep weight off nose wheel
- Smoothly increase power to maximum as airspeed increases
- Vary elevator control as airspeed increases to maintain slightly nose high sight picture
- Lift off at lowest possible airspeed and lower nose to accelerate in ground effect until a safe flap retraction speed is reached per the POH
- If obstacles are present, accelerate in ground effect until reaching the obstacle clearance speed per the POH
- Once obstacles are cleared, increase to a safe flap retraction speed per the POH



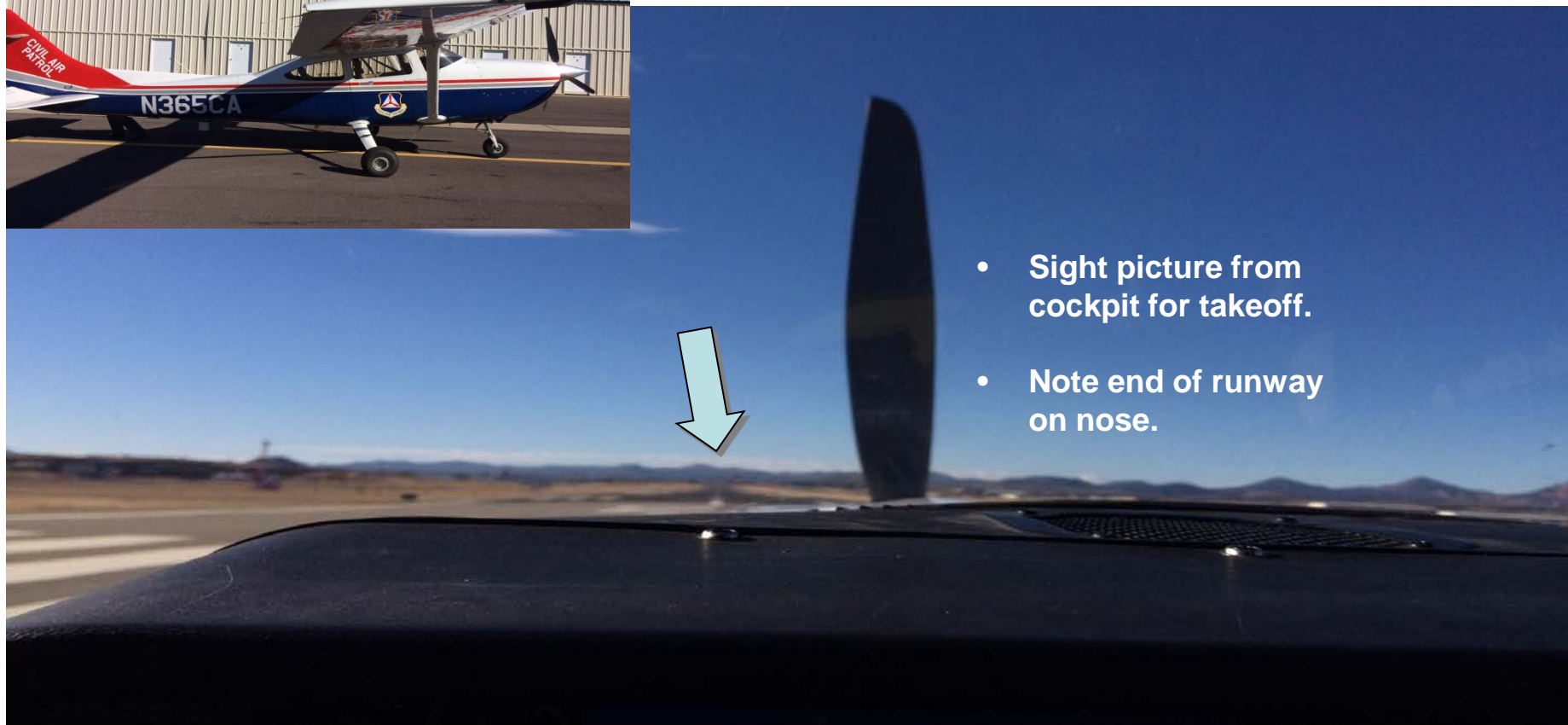
Techniques - The Right Attitude

Attitude for takeoff:

- Note nose wheel just off ground
- 7-8 degrees nose up



Very important: This attitude for takeoff and landing prevents tail strikes and provides a visual reference for directional control.



- Sight picture from cockpit for takeoff.
- Note end of runway on nose.



Techniques - The Wrong Attitude

An attitude of 12.5 degrees will result in a tail strike



At this attitude, you cannot see the runway resulting in a tail strike.





Soft Field Takeoff Common Errors

- Improper use of flaps
- Airplane stopped on runway prior to takeoff
- Improper application of power
- Poor directional control on takeoff
- Brakes improperly used during takeoff
- Excessive pitch attitude
- Drifting uncontrolled during initial climb
- Touchdown inadvertently after lift-off



Soft Field Takeoff Errors





Soft Field Takeoff Errors





ACS – Soft-Field Landing Standards

Task	<i>Task D. Soft-Field Approach and Landing (ASEL)</i>
References	FAA-H-8083-2, FAA-H-8083-3; POH/AFM
Objective	To determine that the applicant exhibits satisfactory knowledge, risk management, and skills associated with a soft-field approach and landing with emphasis on proper use and coordination of flight controls.

Knowledge	The applicant demonstrates understanding of:
PA.IV.D.K1	1. Landing distance.
PA.IV.D.K2	2. Hazards of other than hard surfaced runway.
PA.IV.D.K3	3. Stabilized approach.
PA.IV.D.K4	4. Energy management.
PA.IV.D.K5	5. Wind conditions and effects.
PA.IV.D.K6	6. Density altitude.
PA.IV.D.K7	7. Emergency procedures during approach and landing.

Risk Management	The applicant demonstrates the ability to identify, assess and mitigate risks, encompassing:
PA.IV.D.R1	1. Failure to select the appropriate runway based on wind, pilot capability, and aircraft limitations.
PA.IV.D.R2	2. Exceeding the manufacturer's maximum demonstrated crosswind component.
PA.IV.D.R3	3. Operating from other than a hard surfaced runway.
PA.IV.D.R4	4. Losing elevator control, sinking into the soft surface, or striking the prop if moving too slowly.
PA.IV.D.R5	5. Windshear avoidance.
PA.IV.D.R6	6. Tailwind.
PA.IV.D.R7	7. Wake turbulence.
PA.IV.D.R8	8. Task management.
PA.IV.D.R9	9. Low altitude maneuvering.
PA.IV.D.R10	10. Collision avoidance, scanning, obstacle and wire strike avoidance.
PA.IV.D.R11	11. Failure to follow the right-of-way rules.
PA.IV.D.R12	12. Obstacles on approach and landing paths.
PA.IV.D.R13	13. Failure to recognize the need for a go-around/rejected landing.
PA.IV.D.R14	14. Low altitude stall/spin.
PA.IV.D.R15	15. Performing a soft-field landing after an engine failure.
PA.IV.D.R16	16. Failure to adhere to sterile cockpit requirement.

Skills	The applicant demonstrates the ability to:
PA.IV.D.S1	1. Ensure the aircraft is aligned with the correct/assigned runway.
PA.IV.D.S2	2. Scan the landing runway/area for possible obstructions for landing.
PA.IV.D.S3	3. Complete the appropriate approach and landing checklist.
PA.IV.D.S4	4. Consider the wind conditions, landing surface, and obstructions to select a suitable touchdown point.
PA.IV.D.S5	5. Establish the recommended approach and landing configuration and airspeed, and adjust pitch attitude and power as required.
PA.IV.D.S6	6. Maintain a stabilized approach and recommended airspeed, or in its absence, not more than 1.3 V _{SO} , with wind gust factor applied +10 /-5 knots.
PA.IV.D.S7	7. Make smooth, timely, and correct control application during the round out and touchdown and, for tricycle gear airplanes, keep the nose wheel off the surface until loss of elevator effectiveness.
PA.IV.D.S8	8. Touch down softly with minimum sink rate and no drift, with the airplane's longitudinal axis aligned with center of the runway.
PA.IV.D.S9	9. Maintain full up elevator during rollout and exit the "soft" area at a speed that would preclude sinking into the surface.
PA.IV.D.S10	10. Maintain crosswind correction and directional control throughout the approach and landing sequence, as required.
PA.IV.D.S11	11. Execute a timely go-around decision when the approach cannot be made within the tolerances specified above or for any other condition that may result in an unsafe approach or landing.
PA.IV.D.S12	12. Maintain proper position of the flight controls and sufficient speed to taxi on the soft surface.
PA.IV.D.S13	13. Utilize after landing runway incursion avoidance procedures.



Soft Field Landing Techniques

- Use a normal landing technique (i.e. flap setting appropriate for runway and wind conditions)
- Hold the airplane 1-2' off the surface as long as possible while dissipating airspeed. Add power to control descent rate.
 - Power controls rate of descent
 - Retarding power abruptly will result in a hard landing
- Touch down at or near stall speed, under power with minimum sink, slightly tail low to prevent nosing over
- Hold the nose wheel off the surface as long as possible
- Taxi on soft surfaces with full aft yoke



Soft Field Landing Common Errors

- Required landing distance exceeds available runway length
- Poor airspeed control
- Landing configuration established late
- Throttle closed too abruptly or quickly
- Unstable approach
- Improper use of flaps
- Failure to trim properly
- Excessive descent rate
- Hard impact or bounce at touchdown
- Nose wheel lowered prematurely
- Brakes improperly used
- Go-around situation not recognized



Soft Field Landing Errors





Soft Field Landing Errors



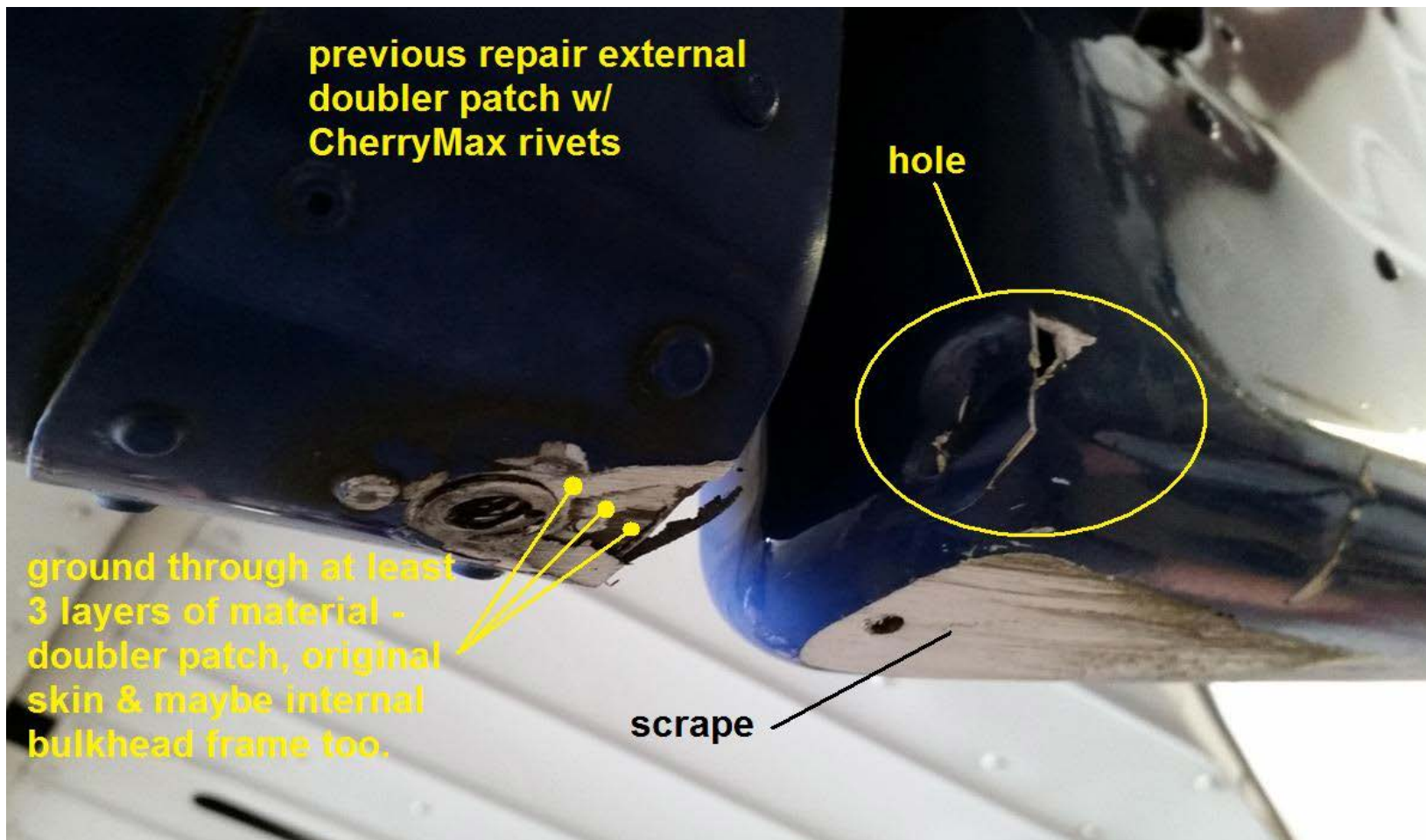


Soft Field Landing Errors





Soft Field Landing Errors





Risk Management Reminders

- Threshold Questions:
 - Do I really need to operate from a short or soft field?
 - If so, am I current, capable, and proficient in these operations?
 - Are there crosswind or gusty wind conditions?
 - Consider doing practice short/soft takeoffs and landings on a long, wide runway to have more options available in case things go sour
- Reminders:
 - Establish & maintain a stabilized approach
 - Keep sight picture on end of the runway
 - Never attempt to save a landing
 - Make the go-around decision early
 - Instructor/Check Pilot must always guard the controls!