WELCOME TO THE TWIN TIME

TWO ENGINES BETTER THAN ONE, RIGHT?

To immediately dispel the misconception that flight safety is always greater in a twin engine airplane, think of it this way: Flying a twin means you are now twice as likely to lose an engine, and of course that can happen in any phase of flight. With effective training, you will learn to engage the emergency of engine loss effectively while extracting the most performance remaining from your airplane. Training in a twin engine aircraft is less about learning to fly a more complex aircraft with two engines, but rather learning to effectively control and manage that aircraft when only one engine is operating.

PERFORMANCE

The number 1 fallacy in many students' minds when first exposed to twin engine aircraft:
When you lose an engine, you lose 50% of its performance.
Wrong. With those two engines producing all that power, comes two engines producing all that drag as well. When you lose an engine on a twin-engine aircraft, you lose 50% of the power the airplane normally produces, and you lose **80-90% of excess thrust (performance).** An airplane's climb performance is a production of this excess thrust. Also, in certain situations, climb performance may also be regarded as the "least sink rate."
To put this performance reduction in perspective, if you're normally climbing at 1200 fpm, with one engine, you're now climbing at 200 fpm. Given enough altitude, the emergency is mitigated somewhat, but consider what that looks like on a takeoff from an airport with surrounding obstacles. Also at 5000' or greater density altitudes, or you're close to gross weight, you are now most likely descending with only one engine operating.
W*hen an engine's power is lost, the remaining performance is not the difference between two engine performance and level flight. Rather it's the difference between two engine performance and a zero power descent.*

CONTROLLABILITY

When both of those engines are pulling equally, thrust is nice and symmetrical. With only 1 engine pulling, asymmetrical thrust develops adverse yaw. There is also a component of asymmetrical lift. The wing with the dead engine now has less airflow over it, resulting in a roll to that side. Without the pilot's effective management of control surfaces and speed, the airplane can quickly become unstable and enter an inverted spin. These aircraft are not known for having good spin recovery time.

ENGINE LOSS- ALWAYS CRITICAL, BUT ONE'S MORE CRITICAL THAN THE OTHER.

The Piper Aztec is a conventional twin. This means both propellers turn as you normally see them- clockwise when looking at them from the cockpit. On a conventional twin, the left engine is the critical engine. Simply put- that means the loss of that engine would most adversely affect the handling and performance of the aircraft.

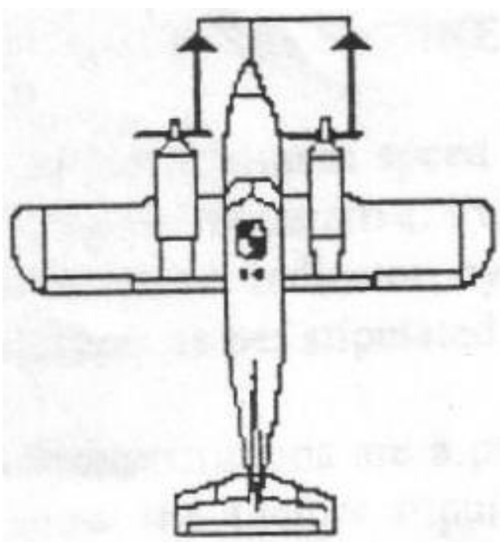
There are some training twins that have counter-rotating props, the result is no (or minimal) critical engine… but again, common sense would tell you any engine is critical. Also, not to forget: An engine can be either performance critical, system critical or both as the left engine is on our Aztec. The Aztec's left engine is the power producer for the hydraulic pump that operates the landing gear and flaps. Now you are manually extending gear and flaps without that system.

So why do we talk about critical engines if they're both critical?

Losing the left (critical) engine means greater adverse yaw. Greater adverse yaw means there is even a smaller margin for error in controlling the airplane.

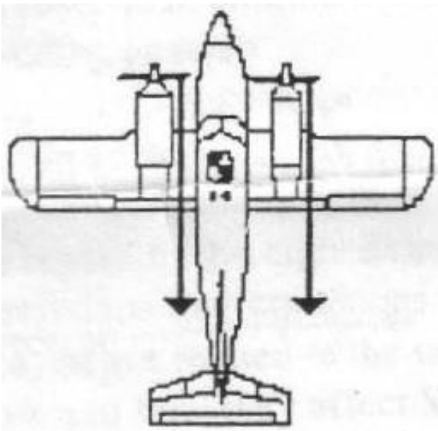
And why the left engine?

P-Factor



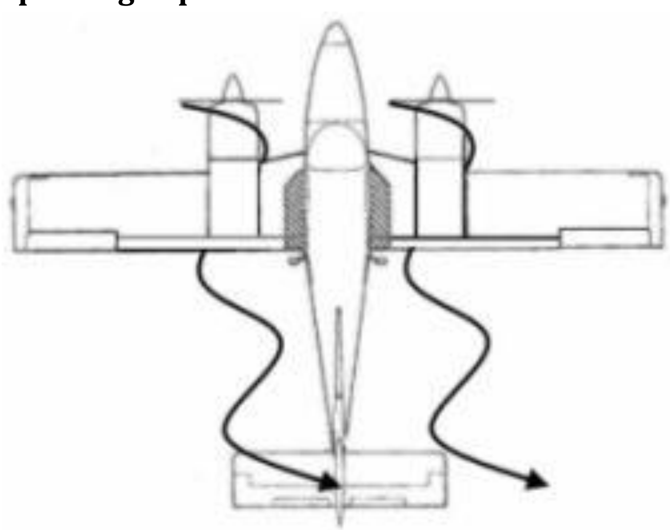
On high angles of attack, the descending blade (right blade) produces more thrust than the ascending blade (left blade). The descending, right blade on the right engine has a longer arm from the CG than the descending (right) blade of the left engine, creating a yaw force to the left. P- Factor causes a conventional twin to yaw to the left. Failure of the left engine will cause more loss of directional than loss of right engine because of the longer arm of the right engine's thrust from the CG.

Accelerated slipstream



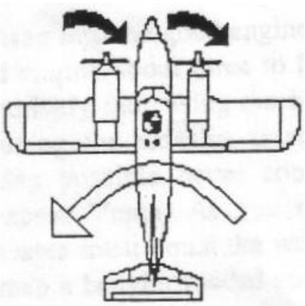
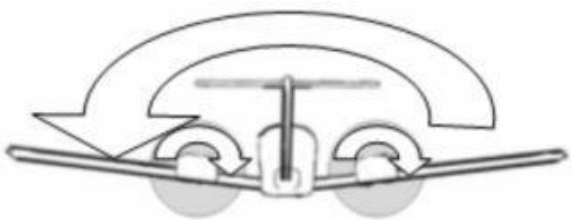
As a result of p-factor, stronger induced lift is produced on the right side of the right engine than on the left side of the left engine by the prop wash. In case of a left engine failure, there would be a strong moment rolling the plane to the left. Also on a failure of the left engine, less negative lift will be produced by the tail, resulting in a pitch down.

Spiraling Slipstream



The spiraling slipstream from the left engine hits the tail from the left. In case of a right engine failure on a conventional twin, this tail force will counteract the yaw towards the left dead engine; but in case of a left engine failure, the slipstream does not hit the tail to counteract the yaw, so there is more loss of directional control.

Torque



For every action there is an opposite and equal reaction (Newton 3 law of motion). As a result of the propellers turning clockwise on a conventional twin, there is a left rolling tendency of the airplane. If the right engine fails, this left roll tendency will help us maintain control and resist the right roll towards the right, dead engine, caused by asymmetric thrust; but if the left engine fails, the left roll tendency by torque will add to the left turning force caused by asymmetric thrust, making it much more difficult to maintain directional control. This makes the left engine critical. On a counter-rotating twin, No matter which engine fails, torque will oppose the roll created by asymmetric thrust.

All this leads us to a new V speed in your repertoire, and the most important to understand during twin engine training:

Vmc – The redline at the lower end of the ASI

Now for the formal definition…

Vmc (minimum control speed) is the calibrated airspeed at which, when the critical engine is suddenly made inoperative, it is possible to maintain control of the airplane with that engine still inoperative, and thereafter maintain straight flight at the same speed with an angle of bank of not more than 5 degrees. The method used to simulate critical engine failure must represent the most critical mode of powerplant failure expected in service with respect to controllability. (FAR 23.149) What this means to you is it is extremely vital to always be cognizant of your airspeed in the event of an engine failure. If Vmc is reached with only one engine operative, there is good chance that the aircraft will become uncontrollable. At this speed, the rudder loses its effectiveness to overcome adverse yaw.

Vmc is dynamic. (Dynamic – means it changes). Although the FAA (FAR 23.149) sets the parameters in which Vmc must be determined for aircraft certification, the airplane's configuration and atmospheric conditions during flight make the speed a moving target. The certification regulations level the playing field between manufacturers so that falsely low Vmc aren't published (increasing sales). Having a good idea under what conditions an aircraft's Vmc must be certified gives the pilot a good idea of what actual Vmc may be for a given flight. However, always assume this redline is a never go below speed, just as the other redline is a never exceed speed.

Vmc certification conditions, FAR 23.149. Airplane Flying Handbook p. 12-28
1. Standard atmosphere. (FAR 23.45)
2. Most unfavorable CG and weight.
3. Out of ground effect.
4. Critical engine INOP.
5. Bank no more than 5° towards operating engine.
6. Max available takeoff power on each engine initially.
7. Trimmed for takeoff.
8. Wing flaps set to takeoff position.
9. Cowl flaps set to takeoff position.
10. Landing gear retracted.
11. All propeller controls in takeoff position. (INOP engine windmilling)
12. Rudder force required by the pilot to maintain control must not exceed 150 pounds.
13. It must be possible to maintain heading ±°20.

The relationship between performance and Vmc can be misunderstood:
It is essential that the pilot understands directional control of the aircraft and its performance are two different things. Factors that lower Vmc and improve directional control are not necessarily good for performance. For example:

Increase in density altitude
- Decreases Vmc (good)
- Decreases Performance (bad)

Increase in weight
- Decreases Vmc (good)
- Decreases Performance (bad)

Windmilling prop (vs. feathered)
- Increases Vmc (bad)
- Decreases Performance (bad)

Aft CG
- Increases Vmc (bad)
- Increases Performance (good)

Flaps extended
- Decreases Vmc (good)
- Decreases Performance (bad)

Gear retracted
- Increases Vmc (bad)
- Increases Performance (good)

Up to 5° Bank towards good engine
- Decreases Vmc (good)

- Increases Performance (good)

*So after all the talk about Vmc, the safest way to react in the event of an engine failure is not to think of Vmc, but rather the speed to shoot for is **Vyse** The Blue Line.*

Vyse: best climb performance on a single engine. This best climb performance in the specific conditions may still only be a descent, but it's the best shot we have at the most time in the air so that we may proceed to a safe landing spot.

NOW THE YOU HAVE THE BASIC UNDERSTANDING, LET'S CALMLY REACT TO AN ENGINE FAILURE IN FLIGHT AT ALTITUDES ABOVE 500' AGL.

Immediate:

- Maintain directional control: counteract that adverse yaw; RUDDER!
- Mixtures / Props / Throttles forward: BALLS TO THE WALL
- Flaps up / Gear Up : decrease drag
- Pitch for Vyse (blue line) or better.

Now just slightly less immediate, but critically important:

- Identify dead engine: Dead foot, dead engine. (The rudder you are not pushing)
- Verify: Slowly bring back throttle on what you presume dead engine is. Bring this one to full idle. The DPE or MEI wll adjust for simulated single engine.
- Decide: Troubleshoot or Feather: If plenty of altitude, run checklist to see if issue can be remedied. (Possible fuel issue). If level flight cannot be maintained and at low altitude, Feather immediately:
- Feather: Touch prop lever, saying to yourself out loud which engine is dead and verifying your hand is pulling back that prop. The DPE or MEI will stop your movement when they deem its close enough to feather.
- Secure: Always speaking out loud to yourself which side you're pulling back and verifying that it's the correct side. Mixture off, fuel selector off, cowl flap closed, alternator off, reduce electrical load.
- Take care of good engine: Set power setting for blue line, watch temps, and adjust cowl flaps as necessary.
- Take care of that directional control. Bank into the good engine least 2-5 degrees. Ball should be halfway out on good engine side so that you are "raising the dead" engine. Trim as required to reduce your work load and keep leg day at a limit.
- Remember: more than that 5 degrees bank may be necessary, but the more you bank, the more vertical lift component you lose.

FOR MOST OF YOUR TRAINING, SINGLE ENGINE OPERATION WILL BE SIMULATED USING ZERO THRUST SETTINGS ON ONE ENGINE.
HOWEVER, ENGINE SHUTDOWNS AND RESTARTS ARE REQUIRED BY THE FAA PTS FOR THE AMEL RATING AND CMEL CERTIFICATE

Although we are steadfast in our training, the weather may not be. We make certain that you are prepared for your check ride, but please realize each flight is at the mercy of your preparation and the weather; multi engine training requires a higher ceiling than most of your previous training. Remember, while training can possibly be done in a few short hours there's no "cramming" for the multi engine rating. We train for you to be a competent pilot with a multi engine rating.

The Piper Aztec (PA-23-250) is a conventional twin. There is much good to be said about the "normal" training twin that most of the other flight schools use; mostly the good to be said is they are a good stepping stone or easy to learn in… The bad is that they're *easy* to learn in and not best grounds for learning real world applications. The Aztec is a much more real world twin in the respect of a critical engine, and it is also a "real" twin in the realm of a giant leap in aircraft power and application. This plane was not designed to be a trainer, but for actual use in freight, and passenger carrying applications. We teach not only multi-engine flying, but also we teach you to stay ahead of the airplane. You will find the Aztec demands attentive management and will stretch your capabilities unlike a normal light training twin. It is quick and subtly complex, but after the completion of your training, the Aztec will be as docile to your touch as a Cessna 150. *It is also just exciting to feel the power and strength of the plane as it takes you to new horizons.*

Study the checklist for your aircraft. We have created one for our specific plane as many schools often do. Ours does include some specific tips that work with our particular aircraft. *Like all machines they tend to have their own quirks and personalities.* The Examiner is going to expect you to understand the systems of the aircraft. Like any future pilot job you are given training materials to study and learn plus the training to execute the knowledge and skills. And a checkride to determine you understand the aircraft, its systems, its performance limitations and aerodynamic and handling of the aircraft. We are training you to a level we would trust the lives of your family, friends and future customers in your skills. Generally it will be expected through insurance requirements to have more hours than what it takes to pass a checkride, so the level we speak of is more that you understand the new risks and take the extra care to practice the good habits and setting your personal minimums as you gain more experience.

PIPER PA-23 TRAINING STANDARDIZATION DATA

	MANIFOLD PSI	RPM	CONFIGURATION	SPEED MPH
TAKEOFF	FULL	Full	GEARDN/FLAPSUP	80
CLIMB Initial	FULL	Full		
Climb above 500’	25	2500	GEAR/FLAPS UP	88-102
Cruise Climb	24	2400	GEAR/FLAPS UP	102-125
TRAINING	20	2400	CLEAN	160
IFR APPROACH				
INITIAL	20	full	CLEAN	130
INTERMEDIATE	18	full	FLAPS 1/4.	120
FINAL	16	full	GEAR DWFLAPS 1/4	120
TRANSITION AT MDA	As Req.	full	GEAR DWFLAPS 1/4	100
TOUCHDOWN	As Req.	full	GEAR DWFLAPS 4/4	80-75
HOLDING	20-22	2300	CLEAN	140
ZERO THRUST	1100	2100	Usually set by CFI/DPE	-
VFR TRAFFIC				
DOWNWIND	15-20	full	GEAR DWFLAPS 1/4	120+
BASE	15	full	GEAR DWFLAPS 1/2	110
FINAL (300 AGL)	14-As Reg.	full	GEAR DWFLAPS FULL	102-90
TOUCHDOWN	As Req.	full	GEAR DWFLAPS FULL	80-75
SLOWFUGHT				
DIRTY	As Req.	full	GEAR DWFLAPS full	75
STEEP TURNS	20-22	23-24	CLEAN	140
SHORT FLD T.O.	FULL	Full	GEAR UP ASAP	85
NOFLAPLNDG	AS REQUIRED	full	GEAR DN/FLAPS UP	90

Single Engine

CLIMB	FULL	Full	CLEAN	88-blue line
IFR APPROACH				
INITIAL	23	full	CLEAN	130
INTERMEDIATE	21	full	CLEAN	120
FINAL	AS REQUIRED	full	GEARDWFLAPSDN	100
HOLDING	23	2400	CLEAN	110
VFR TRAFFIC				
DOWNWIND	22	full	CLEAN	130
BASE	20	full	GEAR DN/FLAPS UP	110
FINAL	18	full	GEARDN/FLAPSDN	100
GO AROUND	FULL	full	CLEANUP	88-blue line

V –Speeds in MPH			
Va	149	Vmc	80
Vfe (1/4)	160	Vso	68
Vfe (1/2)	140	Vsi	74
Vfe (full)	125	Vx	107
Vle	140	Vy	120
Vne	249	Vyse	102
Vno	198	Vr	85

MANEUVERS

NORMAL TAKEOFF

Brief the “passenger” on takeoff procedures prior to clearance for takeoff. Complete appropriate checklists. Align with runway centerline and increase engine manifold pressure to 22 inches. Check all engine instruments. Smoothly release brakes (if held) and continue advancing the power to takeoff power. At Vr initiate a smooth rotation to the appropriate pitch attitude (10° to 15° depending on weight and temperature). Lift-off and accelerate to climb at Vy (120MPH). NOTE: Vr shall never be less than Vmc + 5kts. When safely airborne and passing through 500’ AGL complete the "After Takeoff Checklist" and comply with the normal climb schedule. ACCEPTABLE PERFORMANCE GUIDELINES: V speeds are minimums and should be controlled within +10 and -0kts,

CROSSWIND TAKEOFF

A crosswind takeoff is made in the Aztec in the same manner as in any other aircraft. Aileron is held into the wind during the takeoff roll to keep the upwind wing from lifting off early. Less aileron input is required as airspeed increases. Rudder is used to keep the aircraft aligned on the centerline of the runway. Airspeeds, power settings and trim settings used during a crosswind takeoff are the same as those used for a normal takeoff. The maximum demonstrated crosswind takeoff is 15 MPH.

SHORTFIELD TAKEOFF

This takeoff is to clear a 50ft obstacle. Unlike many aircraft from your training we do not add flaps for this takeoff, part of learning your aircraft and the various types of flaps. These are plain flaps which cause more drag than lift. The best method is to line up on the centerline of the runway as close to the end as possible. Hold brakes as smoothly add power to full. Release brakes rotate at 85mph and maintain 88-95mph in climb till clear of obstacle raising gear as soon as practical. Lower the nose to accelerate to normal climb (usually after 100ft or clear of obstacle.)

ENGINE FAILURE ON TAKEOFF

To practice controlling the aircraft during one of the most critical flight emergencies, It requires the pilot to quickly recognize and identify a foiled engine, be aware of the proper V speeds and emergency procedures, and to apply correct control forces to compensate for resultant power loss.

Rudder input/blocking by during initial takeoff roll may be applied by instructor to simulate engine not powering up. Chop the throttles to idle immediately and rudder plane straight and apply brakes. The aircraft will be placed in takeoff configuration at an appropriate altitude, and takeoff power applied to both engines. At or above 500' agl either throttle will be retarded to idle by the instructor, simulating engine failure after takeoff. The pilot will maintain directional control with rudder and aileron. If the gear is down land the plane, if gear is up the pilot will establish a positive rate of climb and will accelerate to Vxse or Vyse (102 MPH) as appropriate. The pilot will perform the "Engine Failure After Takeoff Checklist/flow" as conditions permit, and while maintaining control of the aircraft. When the pilot has simulated feathering the propeller on the "failed" engine, the instructor will set the power on that engine to zero thrust. ACCEPTABLE PERFORMANCE GUIDELINES: Maintain positive aircraft control. V speeds are considered as minimum and should be controlled within +10,-0 KTS.

CLIMB

Initial climb after takeoff will be made at takeoff power setting. Full Throttle Full Prop and maintained until 500' AGL while the gear is raised. Initial climb airspeed is 102 MPH (safe single engine climb speed), accelerating to best rate of climb airspeed of 120 MPH. Normal climb above 500" AGL will be made at climb power setting, 25" MAP 2500 RPM, 102 MPH. Cruise Climb will be made at climb power setting, 24" MAP 2400 RPM . and 135 MPH until reaching cruise altitude. The mixture should be leaned in the climb to give the desired fuel flow 15-16 GPH, which is approximately best power mixture. ACCEPTABLE PERFORMANCE GUIDELINES: Maintain positive aircraft control. V speeds are considered as minimum and should be controlled within +10,-0 KTS.

STEEP TURNS

This maneuver affords practice in controlling the aircraft with greater than normal bank angles. Speed is stabilized to 149 MPH and a smooth entry to a 50° bank is accomplished. Like other aircraft use your visual indication outside. Using rudder and aileron smoothly roll the plane to the steep bank. Apply back pressure and or relaxing grip as required to maintain the sight picture, and decrease bank angle to stop a altitude loss and increase bank angle to reduce a climb. Pulling back on the yoke to stop altitude loss will only cause the turn to steepen which is often noted with more G force felt in maneuver. This would lead to a death spiral or accelerated stall if slow enough. NOTE: Practice at other speeds may be utilized at the instructor pilot's discretion. ACCEPTABLE PERFORMANCE GUIDELINES: Altitude +/-100', Airspeed +/-10 KTS, Heading +/-5°, Bank +/-5°.

ENROUTE - SLOW FLIGHT

Demonstrate the degree of controllability available while in close proximity to the pre-stall buffet. These maneuvers provide the opportunity to practice control response and requirements in the low speed regimes encountered during takeoffs, landings, and engine-out emergency situations. This maneuver should be accomplished at a minimum of 3000' above the terrain in various configurations and at appropriate airspeeds. Set up as if setting up for landing. Take it one step at a time. Reduce power to 15" MAP. Boost pumps on, add first set of flaps (about a 1.5 second count on flap handle down then return handle to neutral, lower gear (our plane has a quirk which occasionally the lights do not always light up which a quick on and off of the post light switch usually fixes it. It's a random quirk within the dash console area.) add the rest of the flaps and continue reducing or adjusting power to allow plane to slow to 75-80mph while preventing altitude loss. The following are recommended minimum speed practice maneuvers which develop control touch and feel: Turns to specific headings, utilizing specified banks of not more than 20°, Climbing or descending turns to specified headings and altitudes, Banks of 10° while turning alternately to a point 15° either side of specified heading. Emphasis will be placed upon coordinated flight and control usage as well as prompt corrective action in response to undesired airspeed or altitude trends. ACCEPTABLE PERFORMANCE GUIDELINES: Maintain positive aircraft control. Altitude +/- 100 feet, Airspeed +5, -0 KTS, Headings +/- 5 degrees, when appropriate, Clearing turns prior to starting maneuver.

APPROACH TO LANDING STALLS

This maneuver is practiced to familiarize you with the recognition of initial stall buffet and aircraft handling characteristics and to provide training in proper stall recovery techniques. Approach to landing stalls should be practiced at a minimum altitude of 3000' above terrain, with the aircraft in dirty configuration, full flaps and gear down, Props full RPM, mixture full rich and boost pumps on. Consider it the same as doing a landing set up. Some altitude loss may be experienced on the stall buffet recovery; however, the loss should be kept to a minimum.

Lower the gear and full flaps. Slow aircraft to near rotation. Quite possibly will already be in slow flight demo Maintain wings level, on constant heading, can keep throttle idle up to 11' MAP when below 80 MPH and continue to decrease speed by keeping back pressure on yoke as if keeping it from sinking. A tail buffeting vibration will occur prior to the stall light flashing, this buffet is intimidating at first, but we promise the plane will actually not fully stall yet. Initiate recovery from the first stall indication by applying maximum allowable MAP and decreasing pitch attitude. (Some examiners will want to see the stall light others will accept the buffet as first sign you can verify their preference during the ground portion of the exam.) Retract flaps to the approach position ¼ about a 1.5 second count on flap handle then return to neutral position. When a positive rate of climb is attained, retract gear and remainder of the flaps. This maneuver shall be considered complete when the aircraft is at the starting altitude and 102 MPH.(Vyse) or above. ACCEPTABLE PERFORMANCE GUIDELINES: Heading +/-5^0, unless recovering from a bank. Maintain positive control of aircraft. Recovery should be sufficiently smooth to prevent secondary stall buffet. Altitude will be kept to a minimum. Clearing turn may not be required if transitioning from a slow flight to a stall.

TAKEOFF STALLS

Takeoff stalls should be practiced at a minimum altitude of 3000' above terrain, with the aircraft in clean configuration. Some altitude loss may be experienced on the stall buffet recovery; however, the loss should be kept to a minimum. The maneuver shall be started, power set at flight idle or 1000 MAP. Bleed off speed till near rotation speed, maintaining wings level and a constant heading or, maintain an angle of bank max. Add power up to 20'MAP and pitch to climb slightly steeper than normal to further reduce speed till first indication of stall (buffet, stall light). Recover by lowering the nose to near horizon to increase speed and return to normal climb. Occasionally the stall light will flash at initial addition of power, but it is usually preferred to wait for the tail buffet during checkride.

ACCELERATED STALL

Reduce airspeed generally 20-30mph about 85-95MPH above stall speed. Bank aircraft into 45° and add back pressure to induce stall indication generally the excessive g force is the first indication of the stall. Recover at first indication, level wings b. Pitch for horizon and throttles full forward Airspeed increase for 90 or blue line. Then return to cruise power settings.

NORMAL LANDING

At controlled airports, an altitude of 1,000' above airport elevation is used for pattern altitude. Prior to entering the pattern, complete the "Before Landing Flow/Checklist," except landing flaps. One Quarter approach flaps are extended below 160 MPH, and landing gear is extended below 150 MPH. First set of flaps allows you to slow the plane to ready for gear extension speed. Abeam the runway threshold maintain minimum 120 MPH, On base and below 140 MPH. extend one half flaps maintain 110 MPH, After turn is made to final and below 125 MPH select full landing flaps as required and establish stabilized approach at 102 MPH. on short final with landing assured you can begin to slow to 90mph. (Consider blue line as that safe go around speed just in case that engine fails during that phase.) Vertical speed should be controlled with power while airspeed is controlled with elevator. Power should be reduced smoothly to idle just prior to or during flare, as appropriate. Maintain required back pressure to hold plane level or slight nose up to reduce speed and land generally below speed of 80mph. After touchdown apply brakes as required. Full flaps should always be considered when landing at a short field or with a no/light wind situation. ACCEPTABLE PERFORMANCE GUIDELINES: Touchdown should be made on the centerline of the runway, Touchdown is not short of desired point, nor excessively beyond, Altitude +/- 100 feet on the downwind leg, Airspeed +/- 5 KTS.

SINGLE ENGINE LANDING

For practice purposes, engine failure will be simulated by placing the throttle and propeller of the simulated affected engine to zero thrust position. Single engine best rate of climb speed (88 KTS) should be kept firmly in mind, since in the event of a go-around from the final descent, this airspeed provides the best climb gradient. The single engine Before Landing checklist should be completed if conditions permit before beginning the approach. The approach should be set up to be flown steep, and will be flown at 102 KTS or better (always remaining above Vyse), until landing is assured, slowing to 90mph on short final. The landing gear will be extended as in a normal approach, but often lowered early to simulate the loss of the hydraulic pump if a left engine failure and the drag that apply hand pumping gear down which is as many as 50 cycle of the hand pump. Flaps would remain up. If simulated a right engine failure then normal usage of gear and flaps would be applied. (this may only apply to your aircraft other aircraft may have other systems and you should learn the system that applies to the aircraft you fly at that time.) NOTE: Landing with one prop feathered requires special attention due to the increase in drag brought on by the flattening of blade angle on the operating prop if throttle is reduced to idle. More rudder may be required if actual failure occurs even calling for a tow if unable to taxi. ACCEPTABLE PERFORMANCE GUIDELINES: Altitude +100 feet on downwind, Airspeeds are considered minimums and should be controlled within +10 KTS, Maintain positive aircraft control.

INSTRUMENT APPROACH

The instructor pilot or ATC shall clear the trainee for an instrument approach from any position. The Nav #1 is generally used for almost all approaches which is a Garmin 430W, connected to the HSI. Nav #2 should be used for back-up or as needed for fix identification or missed approach. Check for warning flags. Prior to starting the outbound if doing the procedure turn or intercepting the approach, or the final approach fix, the appropriate parts of the Before Landing checklist shall be accomplished, the flaps extended to 1/4 (if appropriate) below 160mph and airspeed stabilized closer to 120mph. Instrument approaches are the same as in prior instrument training. Landing gear is normally extended when glide slope indicates “one dot above” glide slope interception. Rest of flaps can be added as appropriate or landing assured. At decision height you shall complete the landing or execute a missed approach, as instructed. ACCEPTABLE PERFORMANCE GUIDELINE: Altitude +50 feet except while on glide slope. Deviation from the glide slope should be held to a minimum. Do not descend below DH until the instructor pilot calls, "Runway in Sight,” airspeed +/-5mph.

SINGLE ENGINE INSTRUMENT APPROACH

The instructor pilot or ATC shall clear you for an approach from any position. Generally you will choose a precision approach. The Nav #1 is generally used for almost all approaches which is a Garmin 430W, connected to the HSI. Nav #2 should be used for back-up or as needed for fix identification or missed approach. Check for warning flags. Prior to intercepting the approach course, or the final approach fix, the appropriate parts of the Before Landing checklist shall be accomplished. The landing gear will be extended as in a normal approach, but often lowered early to simulate the loss of the hydraulic pump if a left engine failure and the drag that apply when hand pumping gear down which is as many as 50 cycle of the hand pump. Flaps would remain up. If simulated a right engine failure then normal usage of gear and flaps would be applied. This may also mean in real application pumping the gear down before reaching final approach fix or planning a gear up if aircraft will not maintain altitude/speeds need to reach airport. You should choose an appropriate airfield usually with longer runway for a no flap landing. (Also consider in real situation an airport with emergency crews that can be at the ready. Never be afraid to request emergency crews in these kinds of situations. Paperwork may be involved at the request of ATC but better a couple pieces of paper than an unexpected fire and worse.) Airspeed will be maintained 120mph with flaps up. Verify DH/DA prior to crossing the FAF. Note: **Single Engine go around may not be possible** under certain conditions depending on altitude and weight. Our specific training in most piston twins is this will not be an option. This also would apply in real world applications. After localizer interception, the airspeed will be reduced to 120 KTS minimum and the landing gear will be extended. The flaps will be extended only when landing is assured if is a right engine failure. ACCEPTABLE PERFORMANCE GUIDELINES: Altitude +100 ft. -0 at DH/DA, Any deviation from the glide slope should be held to a minimum. Remaing slightly high is acceptable. Do not descend below DH until the instructor pilot calls, "Runway in Sight," airspeed +/-5 KTS.

CIRCLING APPROACH.

The circling approach follows a descent to circling minimums. The configuration of the airplane shall be: Gear-down, Flaps- approach. The minimum airspeed to maintain while circling will be 110mph. Full flaps will be extended when landing is assured. A normal pattern will be established from the instrument approach flown to circle to the appropriate runway. Maneuver along the shortest path to the base or downwind leg, as appropriate, considering existing weather conditions. There is no restriction against passing over the airport or other runways. The aircraft should be kept at circling altitude until it is a position from which a descent to landing on the intended runway can be made at a normal rate of descent. In the event of a missed approach, the pilot should make an initial climbing turn in the direction of the runway, and continue that turn until established on the missed approach course. Thereafter, fly the prescribed missed approach procedure. ACCEPTABLE PERFORMANCE GUIDELINES: Altitude +100 feet, -0 feet, Airspeed +/-5 KTS.

EMERGENCY DESCENT

This maneuver affords training in recommended procedures for establishing the highest practical rate of descent available during emergency conditions arising from an uncontrollable fire, or from any other situation demanding an immediate and rapid descent.

PROCEDURE: Gear and Flaps Retracted, (Optional to extend gear if speed appropriate to increase drag allowing to descend quickly). Throttles to Idle, prop controls full forward (to increase drag) Dive at 198MPH if clean, 149mph if in rough air, or 140mph if gear extending. Cowl flaps closed (generally would be if in cruise), for training purposes they can usually remain open if not a long descent planned. ACCEPTABLE PERFORMANCE GUIDELINES: Maintain positive aircraft control. Do not exceed designated maximum speeds. Maintain positive "G" forces. NOTE: For training purposes as soon as the aircraft is configured properly, all prescribed procedures are completed, and the descent is established and stabilized, this maneuver shall be terminated.

Vmc DEMONSTARATION

PROCEDURE: Gear and Flaps Retracted. Power: Left engine simulated failure by pulling to idle good engine 12" MP prop to full, both mixtures to full and boost pumps on. Reduce speed below Vmc. Push power of right engine till loss of control. (Heading) and full rudder applied. Note that if allowed to slow further the right wing begins to rise which induces the pilots to apply more right aileron. Recover.: reduce power on good engine, lower nose, also known as chop (power, which immediately drops right wing to level) and drop (nose to regain speed to blue line) once speed is developed and control regained then add power. At this point both throttles can be advanced back to 15-20" MAP. ACCEPTABLE PERFORMANCE GUIDELINES: Maintain positive aircraft control. Do not exceed designated maximum speeds. Maintain positive "G" forces. NOTE: As soon as the aircraft is configured properly, all prescribed procedures are completed, and the descent is established and stabilized, this maneuver shall be terminated.

Multi Engine Add on Checklist

Lessons	Introduced	Practice	Proficient	Checkride proficient	Requirement met
Preflight					
Checklist Usage					
Weight and Balance					
Performance and Limitations					
V Speeds					
Operation of systems					
Before takeoff checks					
Normal Takeoffs					
Normal Landings					
Crosswind Takeoff/landings					
Go Around/rejected Landing					
Short Field takeoff/Landings					
Steep Turns					
Slow Flight					
Approach to landing Stall					
Takeoff Stall					
Accelerated Stall					
Spin Awareness					
Emergency Descent					
VMC Demo					
Engine failure during takeoff roll					

Engine failure after rotation (sim)					
Approach and landing with engine failure (500agl)					
Engine failure cruise (instrument ref)					
Maneuvering one engine					
Engine shut down and restart					
Instrument Approach. Single engine					
Systems/equipment malfunctions					
Parking and Securing					
GPS usage and approaches					
Prepatory Dual within 60 days					

GROUND (ORAL) GUIDE

Vmc

A thorough knowledge of Vmc is probably the most important subject on the oral exam.

Be able to define Vmc.

How does the manufacturer determine Vmc speed?

What happens to Vmc if the aircraft is loaded aft of the CG limit?

How is Vmc Determined?

Critical Engine? Be able to define critical engine. How is it determined? Why do some airplanes have a critical engine and some don't? Does the Aztec have a critical engine?

Performance Charts

Weight and Balance

Be able to show a W/B but be prepared for them to relocate passenger or cargo in reference to that Vmc knowledge.

Know your systems! - Fuel system, Landing gear, Hydraulic, Electrical system, Constant speed, full feathering props, Heater system. Every flight training on any aircraft will always have intense requirement of knowing your aircrafts various systems including the basic heater or A/C system, emergency procedures and memory items.

Airspeeds

What causes a minimum controllable airspeed?

How do these criteria affect Vmc?

- Maximum takeoff power
- Critical engine inoperative
- Inoperative engine windmilling
- Sea level conditions
- Most unfavorable legal weight (lightest weight)
- Most unfavorable legal center of gravity (aft c of g)
- Out of ground effect
- Gear retracted
- Cowl flaps open
- 5° of bank into the operating engine.