

# A Guide for the Conduct of Biennial Flight Reviews

# DRAFT

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## Preface

This report presents a protocol for the conduct of a standardized Biennial Flight Review (BFR) based upon a multi-year research program to assess objectively the skill retention levels of pilots (Jensen, et al, 1998). This protocol includes guidance for Certificated Flight Instructors (CFIs) on the selection of specific maneuvers to be performed based upon pilot characteristics such as total and recent experience, ordering of maneuvers, standardized grading procedures based upon the FAA practical test standards, and procedures for the assessment of pilot judgment. The protocol addresses both ground and in-flight assessment.

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# A Guide for the Conduct of Biennial Flight Reviews

The retention of pilot flight skills is a critical factor in the overall safety and efficiency of general aviation operations. Data records of the National Transportation Safety Board indicate that the problem of flight skill retention among pilots of all experience levels is of great concern. This report implements the results of two studies performed to assess objectively the skill retention levels of pilots.

The first study evaluated the performance of relatively inexperienced private pilots 8, 16, and 24 months following their certification (Childs, Spears and Prophet, 1983). This two year longitudinal investigation evaluated pilot skills from the time of their certification as private pilots using four skill checkrides. The objective in-flight data collection instrument used to gather performance data for the retention checks was also used at the point of initial certification insuring meaningful data comparisons. These flight skill retention checks conducted at eight month intervals over a two year period identified the specific nature and degree of the decrement function that occurs for infrequently practiced flight skills. The empirical data provided by these checks should enable Certificated Flight Instructors (CFIs) to make a more valid judgment concerning the contents and performance of a Biennial Flight Review.

## I. BACKGROUND

Flight skills, like any complex skills, will degrade over time if not exercised sufficiently for the pilot to be able to retain or improve them. Therefore, when pilots do not fly for extended periods of time, their flying skills degrade and they often will make errors when they resume flying. Even if pilots fly regularly, their skill in executing flight tasks that are not performed frequently, such as running out of fuel or inadvertent IMC, still may degrade significantly. In addition, flight tasks that are routinely performed improperly also deteriorate, and if consistently practiced incorrectly result in undesirable habit patterns which may be unsafe.

### Historical Perspectives

The flying skill degradation problem can only be addressed through effective continuation training programs. To be effective, such training and associated pilot proficiency evaluations should focus on critical flight skills that are the most likely to degrade over time. To determine the flight tasks that demonstrated the greatest overall decrement during the two year period studied by Childs (1983), a composite ranking procedure was developed. This was considered necessary since skill decrement on some tasks manifested itself differently over the retention interval than skill decrement on others. For example, certain flight tasks showed a decline in

performance after 16 months, but remained relatively stable thereafter, while other tasks continued to decline. Composite skill loss was derived by:

1. Error rate on the 24 month checkride
2. Increment in error rate from the private pilot check to the 24 month check
3. Increment in error rate from the private pilot check to the 16 month check.

The three ranks generated for each flight task were then averaged to derive a composite rank. Based on this ranking procedure, the flight tasks that exhibited the greatest and least relative amounts of skill loss were determined as shown in Table 1 (Childs, 1983).

**Table 1 Composite Skill Loss for Flight Tasks**  
(Lowest Rank = Greatest Skill Loss)

1. Landing (Uncontrolled Field)
2. Traffic Pattern (Uncontrolled Field)
3. Short Field Landing
4. Accelerated Stall
5. Steep Turns
6. S Turns Across a Road
7. Turns About a Point
8. Rate Climb (Hooded)
9. Magnetic Compass Turn (Hooded)
10. Minimum Controllable Airspeed
11. Short Field Takeoff
12. Crosswind Landing
13. Landing (Controlled Field)
14. VOR Tracking
15. Crosswind Takeoff
16. 180° Turn (Hooded)
17. Normal Takeoff and Departure
18. Soft Field Takeoff
19. Unusual Attitude Recovery (Hooded)
20. Takeoff/Departure Stall
21. Forced Landing
22. Straight and Level
23. Approach Stall
24. Communications
25. Engine Failure
26. Go-Around
27. Engine Runup/Before Takeoff Check



This composite data can be compared with skill loss data at the 24 month checkride. Figure 1 shows the tasks that demonstrated the greatest and least absolute amounts of skill loss over that period. The mean decrement (private pilot check to 24 month check) for the 11 tasks that underwent the greatest absolute amount of skill loss was 44.5%. The eight tasks with the least absolute amount of skill loss had a mean decrement of 19.3%. Comparing this data with Table 1, it can be seen that there is substantial agreement in the tasks included by the two procedures used. However, the rankings of tasks within groupings vary.

Since the composite ranking procedure represents more aspects of performance, it was used in characterizing the high and low skill loss tasks for purposes of preparing the Standardized BFR Guidelines. These guidelines will identify those areas where weakness exist for the BFR candidate and aid the CFI in identifying those flight tasks that may require intermediate flight training to forestall skill decrement.

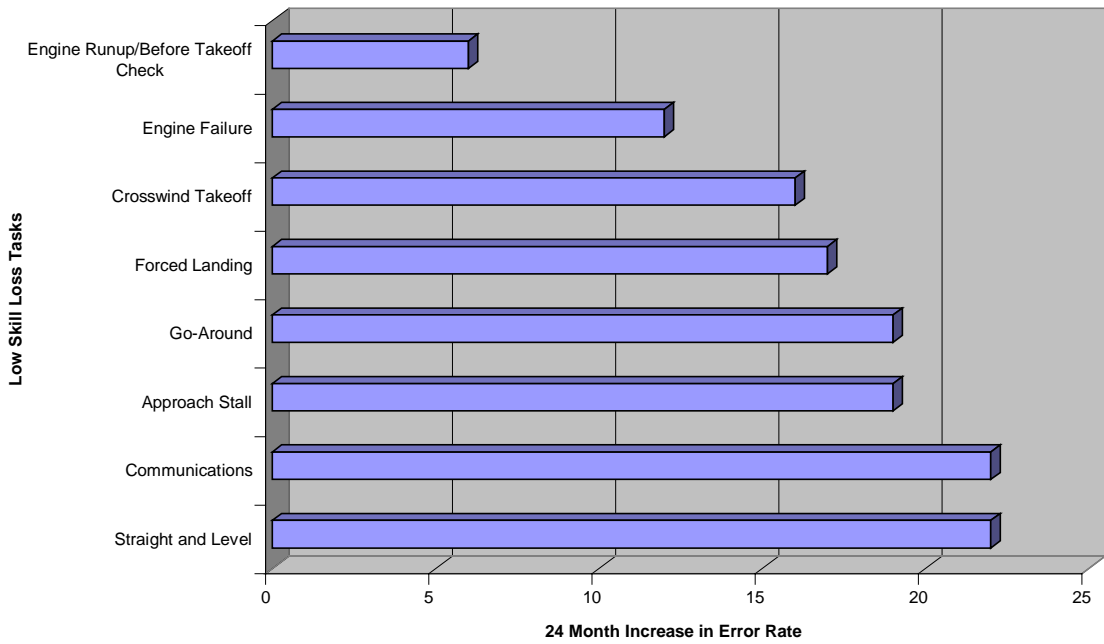
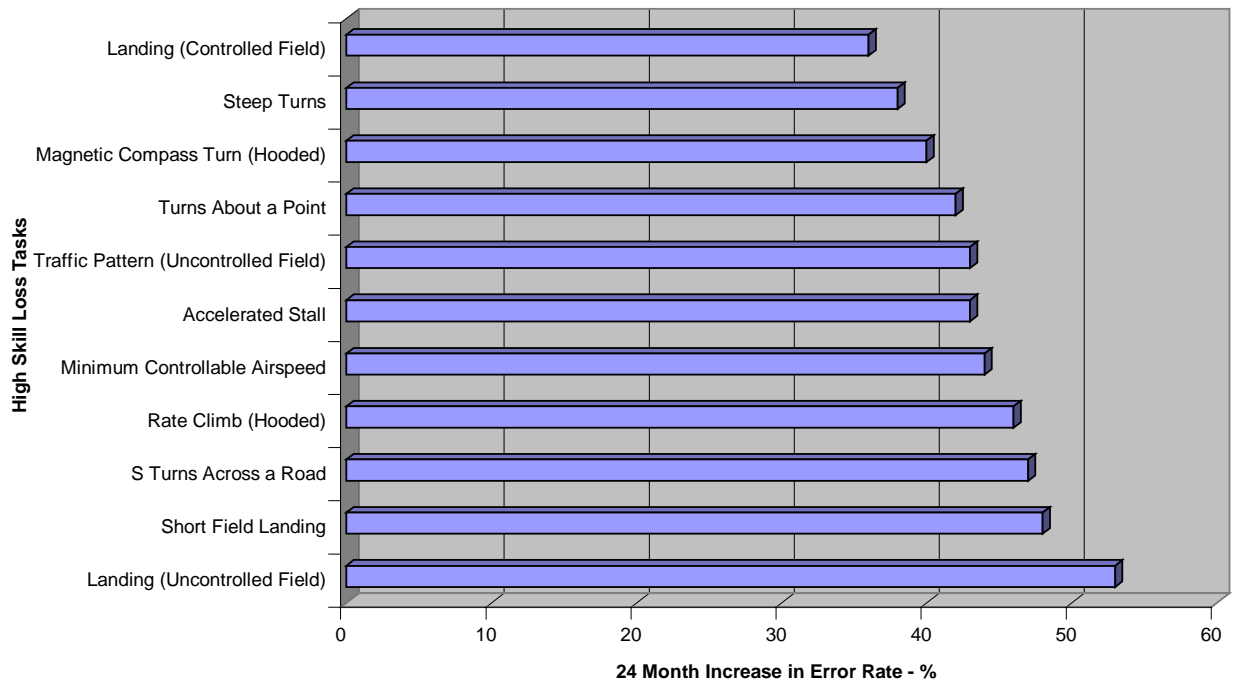


Figure 1 Flight Tasks Exhibiting the Greatest and Least 24 month Skill Loss

## Procedures for the Assessment of Pilot Judgment

This material is designed to aid instructors and examiners in assessing Aeronautical Decision Making. Both quantitative and qualitative techniques are provided for use in ground and inflight evaluations as appropriate for each individual and situation.

## OBJECTIVES

To determine that the applicant:

1. Is aware of and applies the principles of Aeronautical Decision Making.
2. Demonstrates sound decision making throughout the process of a typical flight.
3. Maintains adequate situation awareness in all Areas of Operation to insure appropriate decisions can be made.
4. Displays motivations, attitudes and decision making habits consistent with safe flight operations.

## INFLIGHT DECISION MAKING

The basic measurement of pilot decision making will contain both subjective and objective components. The subjective components will be the examiner's evaluation of the applicant's response to theoretical (on-the-ground) decisions and in-flight decisions which specifically impact safety of flight. The objective components include the examiner's evaluation of the applicant's score on a 10-item checklist of decisional activities performed by the applicant during a test flight. The items to be evaluated are listed in Table 2.

**Table 2 Pilot Decision Making Rating Checklist**

1. Obtained preflight weather information
2. Activated flight plan
3. Checked fuel
4. Requested radar service
5. Checked weather enroute
6. Accurately calculated ETA (Estimated Time of Arrival) for first intersection
7. Activated flight plan to alternate
8. Initiated DR (Dead Reckoning) navigation procedures following equipment failure
9. Elected cruise altitude above Minimum Enroute Altitude (MEA)
10. Requested assistance and/or confessed problems

By assessing the applicant with this checklist and scoring one point for each correct decision, the examiner will develop a score from 0 to 10 for the applicant. A minimum score of 7 is required to pass this part of the decision making evaluation.

## SITUATIONAL AWARENESS EVALUATION

In addition to this quantitative decision making rating, the following pages present a shopping list of 72 decision making test items for use by the examiner. It is suggested that from 10-20 of these test items be used by the examiner in different areas of operation to qualitatively assess the applicant's situational awareness and its impact on decision making performance. Examiner's should make note of the applicant's responses for two reasons. First to supplement their responses to the scored decision making Rating Checklist. Second, to provide topics for discussion and further evaluation if necessary after the checkride. The applicant should be evaluated based upon the number of correct responses and the timeliness of his/her response. Refer to the ADM Examiners Evaluation form on page 12 for suggested scoring categories.

**VERY IMPORTANT** -- Some of these items describe potentially hazardous situations. The instructor must not allow the applicant to proceed in those situations where the test conditions might present an undue hazard. For example, if the instructor places a piece of tape on the leading edge of the wing to assess what the applicant will do, then the instructor MUST be certain to remove the tape, should the applicant fail to do so. In addition, the instructor must explain to the applicant why the instructor may have suggested that the applicant perform a potentially hazardous action. Do NOT allow the applicant to leave the evaluation unless it is clear to the applicant that the instructor was testing his or her judgment and that the instructor definitely DOES NOT recommend that the applicant perform these actions.

## AREAS OF OPERATION

### Preflight Preparation

1. Ask applicant how they would know if specific inspection requirements have been accomplished. (transponder, ELT, altimeter, static system inspections and tests).
2. Give applicant "estimated" weights for passengers and baggage. Ask applicant the implications for situations where CG will be close to aft limit or max-gross. (applicant should verify estimated weights).

### Preflight Procedures

1. While applicant is using the checklist, attempt to distract them.
2. Observe applicant's reaction if you do not fasten or wear your shoulder harness.
3. Ask applicant if it is always necessary to check the fuel for contamination after refueling.
4. Note if applicant overlooks items when you distract him/her during the preflight inspection.
5. Ask applicant how he/she can tell if the landing gear struts/tires are properly inflated.
6. Ask applicant how to visually determine if there are any hydraulic fluid or oil leaks other than checking the reservoirs (fluid/oil puddles or smears).
7. Ask applicant to plan a cross-country flight below 1,200 feet AGL in uncontrolled airspace and give weather information that is poor (2 ½ miles visibility in fog and

haze), but legal.

8. Ask applicant to plan a cross-country flight that would penetrate a restricted area if flown direct. Note applicant's response.
9. During the preflight, ask applicant what he/she would do if the airplane's checklist was missing.
10. During the preflight, observe the applicant's reaction to a piece of duct tape on the leading edge of the airplane's wing (might cover crack or damage).
11. Ask applicant the wisdom of grossly overestimating the time en route for a proposed cross-country flight plan in order to allow for possible unexpected delays (delay of search and rescue efforts).
12. Give applicant weather information for a proposed cross-country flight which is marginal but legal VFR. Note applicant's reaction.
13. Ask applicant to assume that weather is marginal VFR for a proposed cross-country flight and that the turn coordinator was reported as intermittent or the suction gauge showed bottom of the green arc readings. Ask applicant to make a go/no-go decision.
14. Observe applicant's reaction to a situation where his/her own propwash will blast persons or property behind after starting the engine.
15. Ask applicant to decide on whether a bug-smearred windshield should be cleaned prior to a short local flight. Tell him/her you will help look for other traffic.
16. Ask applicant the implications of flying with minor damage (one stall strip missing, dents, paint chips, etc.) to the leading edge of the wing.
17. During the preflight check of flight controls, block the free movement of the yoke with your arm or leg. Note applicant's reaction.
18. Ask applicant about the advisability of going on a long cross-country flight when fatigued, hungry or ill.
19. Ask applicant if it is always OK to fly when taking medications prescribed by an MD (AME must approve).
20. Ask applicant to comment on the implications of grass or straw in engine compartment or tail cone.

## Inflight Procedures

1. Observe applicant's reaction if an unsecured object (flashlight, clipboard, etc.) is placed in a dangerous location (floor of front seat, baggage shelf, etc.).
2. Note if applicant objects to the placement of an object (clipboard, chart, hat, etc.) on the glareshield which might obscure vision.
3. Note applicant's reaction and reasoning after suggesting that he/she use an inappropriate VFR cruising altitude while enroute on a cross-country flight.
4. Ask applicant about the advisability of flying a course at low altitude over rough terrain or a large body of water (climb or circumnavigate).
5. At an appropriate time during the flight test, determine whether applicant has maintained position awareness by asking him/her to locate position.
6. While over a congested area (city, town, etc.) ask applicant about the advisability of conducting a ground reference maneuver slightly above 1,000 feet AGL.
7. During the flight test, unexpectedly ask applicant to estimate the remaining fuel on board in hours and minutes (within 20 minutes accuracy).
8. During the cross-country portion of the flight test, ask applicant to divert to an alternate airport. Note applicant's response.
9. Disconnect the mike plug and note applicant's reaction when no response is made to a call on UNICOM.
10. Ask applicant to decide on a course of action if unsure of position (lost). Note applicant's actions.
11. Cover the airspeed indicator to simulate an instrument failure while flying in the traffic pattern. Observe applicant's actions.
12. Ask applicant to comment on the selection of a safe altitude in order to cross a mountain range from the leeward side on a windy day (downdrafts and turbulence).
13. Ask applicant what course of action should be taken if caught above an overcast with the OAT at 0 degrees Centigrade (call ATC, pitot heat, remain clear of clouds, etc.).
14. Suggest turning off the Mode C transponder in flight to avoid detection by ATC.



## **Airport Operations**

1. While crossing runways during taxi operations, note whether applicant visually checks for other traffic.
2. Ask the applicant the appropriate action if requested to turn-off at a taxiway already passed. while crossing taxiways during landing operations.

## **Takeoffs, Landings, and Go-Arounds**

1. Ask applicant to set up an approach for landing on a runway which has a wind condition which exceeds the airplane's crosswind limitations.
2. Ask applicant to describe what they would do if the control tower asks them to maintain 30 knots above the normal approach speed on short final due to faster traffic behind.
3. At an uncontrolled airport, ask applicant to estimate a safe interval behind departing traffic. (preceding airplane might abort takeoff).
4. Observe applicant's actions and decisions after simulating an engine power loss shortly after takeoff (Approximately 200 feet AGL).
5. During flight at cruising airspeed, ask applicant to extend the flaps and note if he/she attempts flap extension above the maximum speed.
6. During takeoff roll, simulate an engine failure and note applicant's response.
7. Approach an uncontrolled airport from a direction which requires additional maneuvering to avoid a non-standard entry to the traffic pattern. Observe the applicant's decision making and response.
8. Ask applicant to comment on when it is safe to land on a short (<3,000 feet) runway if the preceding aircraft is slow to clear the runway (possible mechanical problems/your brakes might fail, etc.).
9. With another aircraft on short final, suggest an immediate takeoff. Observe his/her reactions.
10. Open your door while taxiing for immediate takeoff. Observe whether applicant notices this condition.

11. Ask applicant to decide on a course of action after experiencing rapid airspeed fluctuations on short final on a gusty, overcast day (wind shear).
12. On the takeoff roll, ask applicant what he/she would do if the oil temperature gauge was red-lined (abort takeoff, etc.).
13. On climb-out, ask applicant what he/she would do if the oil pressure was decreasing rapidly and the oil temperature was rising.
14. Ask applicant what actions would he/she take if a strong odor of fuel was detected after takeoff (gas caps, fuel drain, primer, etc.).

### **Performance Maneuvers**

1. While flying behind another light airplane, ask applicant to describe what precautions they would take if the aircraft was a large airplane or helicopter. (Wake turbulence/rotor downwash avoidance)

### **Ground Reference Maneuvers**

1. After completion of a ground reference maneuver, ask applicant to demonstrate a stall, without first climbing to a safe altitude. **CAUTION – Do NOT allow the applicant to attempt a stall at low altitude.**

### **Navigation**

1. Situate applicant in close proximity to a VOR station and request a track to the station. Note whether applicant chases the CDI excessively.

### **Air Traffic Control**

1. Ask applicant to describe what they would do if ATC vectored their airplane directly toward a cloud.
2. While operating in the vicinity of controlled airspace, note whether applicant is aware of the need to and the advisability of establishing two-way radio communication with ATC.

### **Slow Flight And Stall**

1. Ask the applicant to describe indications of a stall other than the primary warning systems (light and horn).

2. Following a clearing turn, purposely delay the execution of a maneuver such as a stall to see if applicant re-clears the area.
3. Offer to give applicant a spin demonstration at low altitude or any altitude if the airplane is placarded against spins. Note whether applicant declines or objects.

### **Instrument Flight**

1. Ask applicant which instrument they would use to establish a 3 degree per second turn if they inadvertently flew into Instrument Meteorological Conditions.
2. Ask applicant while under the hood to verify destination airport data (e.g., approach control/ATIS frequencies, etc.)

### **Emergency Operations**

1. Simulate an electrical system failure by turning off the master switch. Determine if applicant can recognize and diagnose the failure.
2. Simulate a navigation radio failure by turning off a radio.
3. Simulate a communications radio failure by turning off a radio.
4. Simulate a vacuum system failure by covering the vacuum powered instruments.
5. Simulate fuel exhaustion by gradually reducing power until power is at idle. Determine if applicant reviews emergency checklist and steers aircraft to emergency landing field.

### **Night Operations**

1. Ask what factors should be considered for local night flight if the instrument panel light fails when taxiing out for takeoff (moonlight, currency, familiarity with the aircraft, etc.).
2. Ask what factors should be considered if during a local night flight one discovers that the flashlight batteries are weak (moonlight, currency, familiarity with the aircraft, other lights in cockpit, etc.).
3. Ask applicant about the risk of flying at night with the temperature/dew point spread at 2 degrees (fog and cloud formation).

### **Post Flight Procedures**

1. After applicant successfully passes the flight test, mention to him/her that someone is looking for a pilot to take them on a night flight in the local area and they would pay all expenses. Ask applicant if he/she would be interested.
2. After completing the flight test, ask the pilot if he/she would be interested in ferrying an unfamiliar airplane to a nearby airport without a checkout.

## HAZARDOUS HABITS EVALUATION

Ask the candidate a representative number of these questions, 10 minimum, to assess his/her typical motivations, attitudes and habits that impact decision making. Record his/her answers as: a. Never b. Seldom c. Sometimes d. Often e. Always. Then, convert each response to a positive (+) or negative (-) Habit/Motivation/Attitude. At least 7/10 +'s are suggested as the minimum required to pass this section of the ADM performance test. Discuss the pilot's responses in the context of decision making, problem solving, risk assessment and safe flight.

1. I--- mind using the autopilot when I can hand fly.
2. I--- focus on one problem at a time.
3. I--- go with my first idea.
4. I--- rely on ATC for traffic separation.
5. I--- use the same type instrument scan for all approaches.
6. I--- skip identifying nav aids aurally.
7. I--- rely totally to primary indicators (e.g. RPM to set power).
8. I--- launch without organizing my maps, pubs, etc.
9. I--- answer ATC calls immediately even if I'm busy.
10. I--- skip reviewing familiar approach plates.
11. I--- wait until I'm sure I'm correct before speaking up?
12. I--- hesitate to correct more senior pilot's.
13. I--- discount advice from low-time crewmembers.
14. I--- try to keep fellow crewmembers happy.
15. I--- feel I have to satisfy management's desires.
16. I--- hesitate to relinquish the controls even when busy.
17. I--- feel the senior pilot has to take the controls during any minor emergency.
18. I--- resent swapping legs because of the weather.
19. I--- dislike flying with people who are different from me (e.g., age).
20. I--- ignore another crewmember's family problems.
21. I--- fly when I feel ill.
22. I--- self-medicate to avoid missing flights.
23. I'd- fly after a death in my family.
24. I'd- fly after a major problem at work.
25. I--- ignore arguments between crewmembers.
26. I'd- fly with a hangover.
27. I--- fly even when very tired.
28. I--- fly when I'm hungry or thirsty.
29. I--- focus my own cockpit duties first and help others, if time permits.
30. I'd- lie to ATC to avoid embarrassment.
31. I--- let myself get "out-of-shape" physically.
32. I--- ignore silly regulations.

33. I--- react very quickly to situations.
34. I--- feel that I can get away with mistakes.
35. I--- handle the most demanding tasks easily.
36. I--- feel circumstances cause most of my problems.
37. I--- hesitate to divert for potential weather problems.
38. I--- try to ignore my shortcomings.
39. I--- feel most aviation dangers are exaggerated.
40. I--- can out-fly everyone in my organization.
41. I--- hesitate to make go-arounds.
42. I'd- rely totally on the book for aborted takeoff speeds.
43. I'd- fly in scud without an instrument clearance.
44. I'd- take-off with a little frost on the surfaces.
45. I'd- fly an aircraft which may be slightly out of c.g.
46. I'd- fly an aircraft which felt some what overgross.
47. I'd- ignore a small maintenance squawk to avoid cancelling a flight.
48. I'd- fly at night anytime I would go in the day.
49. I--- can go slightly below minimums if necessary when shooting an approach.
50. I--- skip getting destination weather up-dates enroute.

## OVERALL APPLICANT SCORING

The overall Aeronautical Decision Making rating of each applicant may be performed using the following cumulative scoring sheet.

### Aeronautical Decision Making Examiner Evaluation

TEST	DESCRIPTION	Example	SCORE
1	Rating Checklist (10= maximum possible, 7=passing score)	8	
2	Situational Awareness		
	Responded to all questions correctly and timely (5 points)		
	Responded to all questions correctly but slowly (4 points)	4	
	Did not respond to all questions, but was reasonably aware most (70%) of the time (3 points)		
	Responded correctly to 50% of the questions, but slowly (2 points)		
	Did not respond to any questions correctly (0 points)		
3	Hazardous Habits		
	Number of positive (+) motivations, attitudes, habits)	6	
	Number of negative (-) motivations, attitudes, habits	4	
	TOTAL AERONAUTICAL DECISION MAKING SCORE (Total Score of 70% or greater required to pass)	18/25 72%	

*Pass* \_\_\_\_\_

III. VFR AND ALL GENERAL FLIGHT OPERATIONS

IV. IFR FLIGHT OPERATIONS

V. CHECKLISTS

Preflight  
In-Flight

(AAC-RSL)  
(AAC-RSL)

## REFERENCES

Childs, J. M., Spears, W. D., and Prophet, W. W. (1983). Private Pilot Flight Skill Retention 8, 16, and 24 Months Following Certification. (DOT Publication Report No. DOT/FAA/CT-83/34) Washington, DC: U.S. Government Printing Office.