Pro Flight Trainer Accuracy Flight Test

Test-Pilot's guide

Revision 2

1. Contents

Overview of Tests and Maneuvers and score distribution

topics and factors

> flight dynamics -> factor 15 (max 525)
>
> cockpit -> factor 12 (max 120)
>
> systems -> factor 15 (max 225)
>
> manuals -> factor 7 (max 70)
>
> other -> factor 1 (max 60)
>
> max total points = 1000

It is important that the simulator configuration used for the test will have enough FPS, to make sure lag or bad reactions are not coming from the simulator itself. We want to judge the add-on aerodynamics; low FPS can hinder its performance.

The following lines give hints on how to perform the manoeuver. Make sure to understand the full manoeuver, and how the real helicopter would react during the test. Don't judge in respect to your feelings or wishes, but in respect to how the real machine would react. You can make notes if you feel something is really bad or really fantastic to help potential new pilots be aware of special features or issues using the last column of the scoring sheet.

The guidelines are written in 3 lines

       A.   Guideline on how to perform the maneuver
       B.   Guideline on how the helicopters should react
       C.   Guideline on how to give points

These tests are meant to demonstrate best aerodynamics to help simulator pilot get as close to the realistic helicopter as possible. There for, aerodynamic behavior has by far the highest score, followed by systems and cockpit. It can also be stated that the goal is to compare simulator setup, and to help new simulator pilots to understand what is the best for their needs as per:

Simulator Software – Add-ons – Flight Controls

We might publish videos for each maneuver that explain and shows how to fly and test, but for now, we believe those guidelines are sufficient for real life pilots.

Test Descriptions:

1. flight dynamics (max 35)

1.1. Induced Torque - Pedals 0-8

1.1.1. Hover Power Check 0-1 point

A.　　TO into stabilized IGE hover
B.　　Compare to basic realistic behavior and performance of real machine.
C.　　No induced torque, no lateral tendency, overly stable -> 0 point
　　　　Realistic TO and hover behavior -> 1 point

1.1.2. No Pedal TO/LDG   0-2 points

A.　　Center Pedals and try TO/LDG without touching the pedals / power on
B.　　Helicopter should have torque effect and make the TO/LDG almost impossible because of rotations induced by torque.
C.　　TO and LDG possible with not much problems -> 0 point
　　　　TO and LDG possible with some problems -> 1 point
　　　　Realistic TO and LDG behavior -> 2 points

1.1.3. Pedal Input required / Max Pedal Turn Rate   0-2 points

A.　　Establish steady hover – make 360 turns left and right
　　　　Fly with Full pedal depressed
　　　　Establish level flight and fly 360 coordinated turn, note pedal compensations
B.　　Pedal input in 360 hover turn should be realistic, same for level flight turns
C.　　Pedal input way too little or too big -> 0 points
　　　　Pedal input somehow realistic -> 1 point
　　　　Pedal input realistic -> 2 points

1.1.4. MTOW and EW influence   0-1 point

A.　　Take off at MTOW, note pedal position
　　　　Establish Level flight and note pedal position
　　　　Establish descent and note pedal position
　　　　Do the same with lowest possible weight configuration and compare pedal position in each flight situation
　　　　Pedal position can also be compared inducing significant change in flight altitude
B.　　Weight should affect Pedal Position, more power pedal needed with higher weight configuration
C.　　No or little change induced -> 0 point
　　　　Realistic change induced -> 1 point

1.1.5. Torque and RPM influence 0-2 points

A.　　Establish Cruise and level flight, use power pedal and watch RPM and Torque
　　　　Do the same during Hover
B.　　Power Pedal should affect Torque and TOT, power pedal induces Torque rise and RPM should decrease
C.　　No RPM or Torque change induced -> 0 point
　　　　Little RPM or torque change induced -> 1 point
　　　　Realistic RPM or Torque change induced -> 2 points

1.2. RPM - Throttle 0-6

1.2.1. RPM reaction in Flare   0-2 points

A.   Establish level cruise flight. Quick-stop Flare and check RPM changes
      Establish level cruise flight. Make a 30-degree bank turn, and check RPM changes
      Check RPM changes during AR flare.

B.   Any attitude change loading the disc should directly impact RPM, Quick-stop, AR
      Flare and bank turn all induce RPM acceleration

C.   No RPM change -> 0 point
      Small or delayed RPM change -> 1 point
      Direct and realistic RPM reaction -> 2 points

1.2.2. Needle Separation   0-2 points

A.   Check Engine and Rotor RPM needles while starting up, closing throttle fast, and
      reopening throttle during AR

B.   NR and N2 needle separation should be direct and fast while closing throttle in AR
      introduction, needles should stay together whenever throttle remains open
      during most flight maneuvers.

C.   No separation -> 0 point
      Small separation, or not realistic -> 1 point
      Direct and realistic behavior -> 2 points

1.2.3. Power Limited Approach   0-1 point

A.   Fly a flat shallow approach at high altitude with loaded disc and monitor RPM
      while entering HIGE, perform a steep approach on the same spot and compare
      RPM behavior and collective position while entering HIGE

B.   There should be a pronounced difference when approaching on a shallow path,
      using less torque with a loaded disc during high altitude landings. RPM should
      remain pretty stable while entering HIGE. There will be a much higher collective
      input change while using a steep approach, and logically a higher RPM drop
      should occur.

C.   No real difference noticeable -> 0 point
      Difference easily noticeable -> 1 point

1.2.4. Warnings and Caution indications 0-1 point

A.   Establish level cruise flight, Flare to induce Over-RPM, check behavior, warnings
      and controls reactions, during power on or power off
      On the ground, check warnings when closing throttle and passing minimum RPM
      (Of course in comparison to real machine, not all helicopters are equipped with
      the same low and high RPM warning systems)

B.   Most helicopters have low RPM warning horns and lights; some have high RPM
      warning systems too. Make sure to compare to the real aircraft's and type
      behavior.

C.   No accurate low RPM warning light and Horn with power on or off -> 0 point
      Accurate warning systems -> 1 point

1.3. Collective 0-5

1.3.1. Realistic Torque/Manifold Readings   0-2 point

A.   Perform TO and LDG at common density altitude with MTOW and other common settings to your personal flight experience. Make sure to compare to a flight experience you have done recently, to better recall estimated torque readings! Don't forget to include temperature (extremely important) and pressure into your comparisons and estimations. Another easy way to compare is to do steady HIGE and HOGE on similar spots, and compare readings

B.   There should be a significant difference on performance for TO and LDG in high altitude "Hot day" conditions. Also, every change in Collective input should have a direct influence on Torque readings

C.   Instrument Readings not realistic -> 0 point
Instrument Readings somehow realistic -> 1 point
Instrument readings close to real machine -> 2 points

1.3.2. RPM Reaction on Collective inputs 0-2 points

A.   Establish hover; check how rpm is affected by collective input in a straight climb/descent
Establish level flight; check how rpm is affected by collective input

B.   A very direct influence from Collective should be observed on RPM, drop when raising collective, raise when descending collective

C.   No reaction -> 0 point
Small or delayed reaction -> 1 point
Direct and realistic reaction -> 2 points

1.3.3. Vertical Climb Rates 0-1 point

A.   Establish Climb as recommended per FM and monitor VSI

B.   For this test, it is very important again to be aware of performance calculation and influences. Make sure to compare to similar conditions, OAT, Pressure etc…

C.   Check with FM -> climb rate is off by more than 500ft/min   -> 0 point
Check with FM -> climb rate is within 500ft/min   -> 1 point

1.4. Cyclic 0-4

1.4.1. TO/Hover Position   0-2 points

A.   TO and monitor cyclic position in different weight and wind conditions
Option Nr2… go to Hover, check cyclic position, then change CG load and monitor cyclic adjustment needed.

B.   Most helicopters have cyclic position tendencies due to Main Rotor Mast Design and other mechanical construction reasons (example: AS350 last point touching during TO is usually back of right skid; Bell machine needs right cyclic input while transferring into hover, etc…)
Option 2 is to make sure different loads will affect CG and Cyclic position

C.   No Cyclic position change while transferring into low hover -> 0 point
Some Cyclic position change, but not realistic -> 1 point
Realistic Cyclic input compared to real machine -> 2 points

1.4.2. Translational Lift   0-1 point

A.   Perform IGE take-off and make a slow and smooth acceleration, till reaching translational speed. Monitor Cyclic adjustments needed

B.   Most machines will need quite some cyclic inputs to keep a steady path while going thru translational lift/speed. Compare the inputs to your most recent flight experience for best comparison

C.   No adjustment needed -> 0 point
        Realistic adjustment needed -> 1point

1.4.3. Slopes 0-1 point

A.   Land on different Slope Angle and use forward, left and right slope

B.   Compare slope landing behavior with real experience. Check if smooth "one skid down" to "full down" transition can be accomplished

C.   Slope landing behavior unrealistic -> 0 point
        Slope landing behavior close to real one -> 1 point

1.5. Sensitivity 0-5

1.5.1. Controls   0-5 points

A.   Fly full circuits, make shallow and steep approaches, make square hover taxi exercises etc… Monitor general sensitivity of controls

B.   This test is of course somehow subjective to the tester, but the idea is to give new user an idea of how sensible and direct the machine will fly, and how it compares to the real flight experience. Usually; the higher sensitivity the better, since most new pilots will fly smaller machine like Schweizer 300, R22, Cabri G2, Mosquito, etc…
        Judge on your personal experience and score based on your own personal judgments. Do the inputs feel close to what you experience in the real machine? You might include print screen of your control settings to show current simulator sensitivity settings, and help other configure their controls to achieve similar results.

C.   Feels very different than the real experience -> 0 points
        Somehow similar -> 1-3 points
        Close to real flight experience -> 4-5 points

1.6. Special Equipment 0-2

1.6.1. VR Equipment   0-1 point

A.   Check if Vertical reference/sling load flight and equipment is available

B.   No further instructions

C.   No VR available -> 0 point

D.   VR available -> 1 point

1.6.2. Others   0-1 point

A.   Your chance to add points for a special equipment features that helps new pilots into getting special training, like winch, snow skids, etc…

B.   Make sure to add a comment if you give points, to help understand your reasons behind the decision

C.   Nothing special -> 0 point
        Special equipment (with comment) -> 1 point

1.7. Personal judgment 0-5

1.7.1. Personal Opinion 0-5 points

A.   Based on your real-life experience, how close does the general usage and flight experience feels compared to real flight experience.

B.   Give points per your personal judgment; make sure to comment your decision!

C.   Based on personal judgment –> 0-5 points

2. cockpit (max 10)

2.1. 3D cockpit 0-10

2.1.1. Against real panel 0-3 points

A.   Compare instrumentation and button layout to real machine; also, compare warning lights and other important instrumentation

B.   Instrument should be placed in a realistic manner, so that real flight conditions are reflected

C.   Most instrument not working, or misplaced -> 0 point
Most instrument well placed, most light working -> 1-2 points
All Instruments well placed, all important warning systems working -> 3 points

2.1.2. Button features and animations 0-3 points

A.   Test buttons functionality, go thru standard procedure per standard checklist, emergencies procedures etc…

B.   It can tremendously help new pilots to be able to press all buttons etc… as they'll have to do during real flight training

C.   Buttons not working, no sound, etc -> 0 point
Buttons somehow working -> 1-2 points
All important buttons working -> 3 points

2.1.3. Readability 0-2 points

A.   Check different view angles and sun situation to compare readability in flight and on ground

B.   Some simulator panels tend to be unreadable at high angle settings, which affects a lot the realistic view of important instrument while flying

C.   Most instruments not really readable in 3D cockpit -> 0 point
Most Instruments well readable -> 1 point
All important instruments well readable in all angles -> 2 points

2.1.4. Other views 0-2

A.   Check if special views are available, to facilitate some procedural work, or standard VR view for example

B.   Add points if special view preset are available

C.   No special views/features -> 0 point
Some special views, but not necessarily helping flight training -> 1 point
All important special views available -> 2 points

3. systems (max 15)

3.1. procedural 0-5

3.1.1. starts and shutdowns 0-3 points

A.   perform startup and shutdown according to FM
B.   Compare to real procedure and check accuracy of gauges, readings, sequential order etc… Can a standard procedure be fully replicated to help remember and practice checklist and real procedures?
C.   No real startup or shutdown available -> 0 point
Procedures partially available or partially accurate -> 1-2 points
Start-up and shutdown mostly accurate, simulator could be used for transitional training towards new rating for example -> 3 points

3.1.2. Others 0-2 points

A.   Perform emergency procedures as per FM
Compare to real flight experience and give points accordingly.
For example:
Can Hydraulic Failure be somehow simulated?
Can an engine failure or other system failure be randomly simulated?
B.   Any realistic behavior helps new pilot to immerse into the cockpit feeling, and should be considered a + value. Make sure to comment if you add points!
C.   No other procedures possible -> 0 point
Some procedures available -> 1 point
Most important procedures available -> 2 points

3.2. simulated emergencies 0-5

3.2.1. AR 0-2 points

A.   Perform straight-in AR and 360 AR, monitor RPM, rate of descent, and control positions
B.   Helicopter and instruments should behave similar to real machine, many simulator have a very hard time to simulate AR properly, especially during flare and touch down
C.   AR not realistic at all, or even not possible -> 0 point
AR somehow possible -> 1 point
Most of AR possible (keep in mind that no add-on will be perfect in this area, mostly due to simulator software limitations) -> 2 points

3.2.2. Hover AR 0-1 points

A.   Perform Hover AR and monitor nose tendency, lateral tendency, and general behavior
B.   Most helicopter have lateral tendencies, and depending on blade weight, rapid or slower RPM deceleration
C.   No real hover AR possible -> 0 point
Hover AR doable, even if not totally perfect (add comment!) -> 1 point

3.2.3. Blocked Pedals 0-1 points

A.   Simulate power pedal failure, and blocked pedal approaches
Check if you can land with blocked pedals, and check behavior while decelerating
Check different positions.

B.   Helicopter should turn towards blade rotation while decelerating, check speed settings against real behavior

C.   Blocked pedals not reacting realistically -> 0 point
Blocked pedal approach can be simulated realistically -> 1 point

3.2.4. Others (for example: Hydraulic Out)

A.   Check for other system emergencies simulation

B.   No other instructions

C.   No additional emergency simulation -> 0 point
Some additional emergency simulation -> 1 point

3.3. overall 0-5

3.3.1. Usability 0-1 point

A.   Check if the overall learning curve has been facilitated by special features, like special key combinations, special camera views, etc… anything that helps the user to get comfortable using the add-on quickly

B.   No further instructions

C.   No special features -> 0 point
Special features available (add comment!) -> 1 point

3.3.2. Adjustable Difficulty 0-4 points

A.   Check for different difficulty degree (outside from simulator software settings), and fly with the different settings to compare behavior

B.   Having different level of difficulty helps the learning curve, and the introduction of the aircraft. For example, having a "easy start mode" on a turbine helicopter help the users to start fast, without making one hot start after the other, and getting frustrated even before pulling collective…

C.   No adjustable difficulty -> 0 point
Some adjustment available -> 1 point
Several adjustment available -> 2-4 points

4. User Manual (max 10)

4.1. flight manual 0-8

4.1.1. setup and introduction 0-6 points

A. go thou the manufacturer user guide, and check if the provided information covers all needed aspects for somebody that would fly and setup the add-on for the first time

B. Manufacturer should cover how to install, configure, and basic helicopter procedure as a minimum. Videos should be granted more points, print screen some points, text only should be scored poorly.

C. No user manual -> 0 point
Minimalist user manual -> 1-2 points
Well written and easy to read manuals (add comment!)-> 3-6 points

4.1.2. Details 0-2

A. Check if special attention was given to details, like different calibration or settings procedure on different operating system, maybe some special video guide, or other very good user help

B. No further instructions

C. No social details -> 0 point
Special details available -> 1-2 points

4.2. recommended settings 0-2

4.2.1. settings explanation 0-2 points

A. check if there is a manual / user guide section that explains and shows the manufacturer recommended simulator settings for their add-on, test and compare to real behavior

B. make sure to comment any points you attribute

C. no settings recommendation -> 0 point
settings recommendation available -> 1-2 points

5. others (max 60)

Those points can be attributed on a personal judgment without special guidance.
It is not forbidden to use common sense ☺ ☺ ☺
Keep in mind that this chapter's point won't affect the result too much, but make the difference between a good and a very good add-on.

5.1. costs 0-5

A.   An add-on should not cost $200 unless every single screw has been modeled…
     But we want to see very good development, so good work should get rewarded well
B.   Use common sense and market comparison to other similar products
C.   A fantastic add-on with excellent aerodynamic costing less than $50 should get 5 points

5.2. Performance impact 0-10

A.   An add-on should not slow your pc down to the point you have to set your scenery so low that you don't see a thing anymore…
B.   Compare Frame rate loss against a preinstalled aircraft type
C.   no frame rate loss should get 10 points.

5.3. Paint library 0-5

A.   Is there any other paint scheme available? How nice, how realistic?
B.   Check availability
C.   It is good to reward that aspect of the developer work.

5.4. Check Lists 0-10

A.   Are there any checklists available during normal procedure and 3D cockpit? How accurate?
B.   Checklist should be conforming to real lists
C.   Score according to the degree of accuracy

5.5. External Views 0-5

A.   Do external views show lots of nice detail; can you for example even open the panel and go thru general preflight check instructions?
B.   Check availability
C.   Score according to the degree of accuracy

5.6. Sounds 0-5

A.   Compare to real machine, can you easily hear RPM changes? What about engine start?
B.   Accurate RPM noise is very helpful and important for real flight experience
     But also, other things like fuel pumps etc.… can be a help to build up muscle and brain memory and habits
C.   Score according to the degree of accuracy

5.7. Graphics/Effects 0-5

A.   How does the downwash look over the water? can you use visual wind clues on the ground to tell wind direction? Can you use downwash clues during slope landings?

B.   Wind affecting downwash visual clues is very helpful to develop natural preflight habits, even if this is more a sim rating than an add-on rating
C.   Score according to the degree of accuracy

5.8. Special features 0-15

A.   Check for special features not included in another score
B.   Make sure to comment any points you add
C.   Score according to the degree of accuracy