

# Academy of Model Aeronautics

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## **AMA Turbine Qualification Flight Guide and Waiver Application (510-D)**

The purpose of the qualification flight is for the turbine waiver applicant to demonstrate their skills, knowledge, and understanding of how to safely operate and fly a turbine-powered model aircraft.

This document is intended for use by turbine waiver applicants and by experienced turbine pilots who are providing turbine instruction and/or supervising turbine waiver qualification flights. See AMA Gas Turbine Program (AMA document 510a).

Note: When printed using a double sided printer, the checklist (page 5) and waiver application (page 6) will be printed on a single sheet of paper that is easily used during the evaluation of the waiver ground and flight skills.

This document consists of three sections as follows:

1. Requirements - Complete descriptions the AMA Gas Turbine Program requirements applicable to Turbine Waiver Applicants and Qualification Flights including knowledge and performance standards;
2. Checklist – Requirements, as specified above, provided in a checklist format for use during Turbine Waiver Qualification Flights to ensure the requirements are met; and
3. Turbine Waiver Application to be completed and submitted to the AMA upon successful completion of the Turbine Waiver Qualification Flight.

### **Section 1 - Requirements**

#### **1.1 Pilot Requirements**

The Supervising Pilots shall interview the Applicant to ensure that the Applicant:

- a) is an AMA member. *The Supervising Pilots shall view the Applicant's AMA card.*
- b) has accomplished at least 50 flights on a high-performance model as defined by Section 24 of the AMA Gas Turbine Program (AMA document 510a). *The Supervising Pilots should ask the Applicant about his/her previous experience with high-performance models.*
- c) is familiar with the requirements of the AMA Gas Turbine Program (AMA document 510a). *The Supervising Pilots shall confirm this familiarity by asking the Applicant specific questions about the Gas Turbine Program.*
- d) has previously flown a buddy-box flight, of the turbine-powered model to be used for the Qualification Flight, under the supervision of one of the Experienced Turbine Pilots who will supervise the Qualification Flight. *Typically, the Experienced Turbine Pilot who provided instruction (via buddy-box) to the Applicant is also one of the Supervising Pilots of the Qualification Flight. If the Applicant has not met this requirement, the Supervising Pilots shall supervise a buddy-box flight to confirm the Applicant is safe to fly solo as necessary to perform the Qualification Flight.*

## 1.2 Airframe Requirements

The Supervising Pilots shall inspect the model to be used for the Turbine Waiver Qualification Flight to ensure it meets the following requirements:

- a) The model shall be powered by a single:
  - i. production turbine engine; or
  - ii. kit-built turbine engine built in compliance with AMA Regulations for Assembly and Operations of a Kit Built Turbine Engine for RC and CL Models (AMA document 510b); or
  - iii. non-production turbine engine built in compliance with AMA Rules for Design, Construction, and Operation of Non-Production Gas Turbine Engines for RC and CL Models (AMA document 510c).

*For items ii. or iii. above, the Applicant shall provide proof of compliance.*
- b) Ensure that the turbine has not been excluded by the AMA for safety concerns. *The Supervising Pilots should contact the AMA if there are any concerns regarding this requirement.*
- c) Ensure that the total installed static thrust for the turbine shall not exceed 50 lbs. *De-tuned engine thrust settings will be accepted (Applicant to provide manufacturer documentation) or test the model using a force gauge.*
- d) The turbine uses kerosene, diesel, and/or propane as fuel (unless approved in writing by the AMA).
- e) The fuel tanks are of rigid construction with consideration given to burst and puncture resistance. Plasma bags are not allowed.
- f) The fuel system has two fuel shut-off provisions one of which is manual and the other is remotely operated (an ECU-operated shutdown is compliant as a remote shut-off if it closes with loss of power).
- g) The radio is equipped with a failsafe and the ECU is configured to shut down the engine within 2 seconds of failsafe activation. *Proper setting of the failsafe shall be confirmed by turning off the transmitter while the turbine is running, or by viewing the turbine ground support unit.*
- h) The model is not equipped with an afterburner.
- i) If the model is fitted with other special controls such as water injection, thrust reversers, variable nozzles, etc., the Applicant must supply proof of engine manufacturer support of development testing and user training.
- j) That the engine has not been involved in a crash where high G loads were probable without being examined and certified as safe to operate by a manufacturer approved service center.
- k) Ensure that the model to be used for the Qualification Flight is powered by a single engine and meets the following category-specific requirements:
  - i. Fixed-wing and Fixed-wing Turboprop: turbine-powered model having:
    - a. a controllable rudder(s); and
    - b. a steerable undercarriage suitable for a rolling takeoff and landing; and
    - c. either flaps/flaperons or a speed brake; and
    - d. the ability to come to a controlled stop on command with the engine at idle on a level hard surface.
    - e. the capability of a sustained speed of at least 75 mph (fixed-wing turboprop) or 100 mph (fixed-wing). The maximum speed is 200 mph.

Additionally, the model shall:

    - f. have a minimum weight of at least 12 pounds (dry); OR
    - g. be an ARF specifically designed and produced by the manufacturer for turbine power or converted to turbine power using a conversion kit (including tailpipe) produced by the model's manufacturer. The model shall also comply with items a) through e) above.
  - ii. Rotary-wing:
    - a. The output power of the turbine shall be governed such that the rotor head speed does not exceed the manufacturer's recommended RPM for any rotor head component; and
    - b. The rotor head shall be able to be disengaged from the power source and remain stationary either from the use of a throttle kill mechanism or a clutch system; and
    - c. The model is powered by a turbine or by a 0.60 cubic inch displacement (or larger) engine; and
    - d. The model is capable of 50 mph forward flight speed.

- iii. Control line:
  - a. The model shall successfully perform a pull test of 55 pounds or more, as described in the current CL Scale Competition Rules; and
  - b. A restraining cable (minimum 0.035 stranded wire) shall be attached from the engine to the bellcrank mounting system; and
  - c. The model weighs less than 20 pounds ready to fly.

### **1.3 Turbine Waiver Qualification Flight**

- a) The Applicant will successfully perform the Qualification Flight(s) consisting of all ground operation and flight skills as specified in herein under the supervision of two Experienced Turbine Pilots, one of whom is a contest director. A designated helicopter contest director is required for rotary wing Applicants.
- b) The Qualification may consist of multiple flights, all made on the same day. The final flight shall contain all of the flight skills specified in Section 1.3.2 of this document.
- c) Turbine waiver qualification flights, maiden flights, or test flights following a major repair of the aircraft structure, propulsion system, or control system may not be performed during an event. These flights may be performed before or after the official event hours. Major repairs are those which substantially modify or repair portions of the model such that the result differs from the original form and/or installation. Replacement of parts with the same or equivalent parts is not considered a major repair.
- d) Prior to the Qualification Flight(s), the Applicant must have completed a buddy box flight, of the aircraft to be used during the Qualification Flight(s), under the supervision of one of the Experienced Turbine Pilots who will supervise the Qualification Flight(s).
- e) An additional buddy-box flight on the day of the Qualification Flight(s) is a best practice to give the Applicant an opportunity to warm-up/practice, particularly if the Applicant is not completely familiar or comfortable with the field where the Qualification Flight(s) will be performed.
- f) The Supervising Pilots shall brief the Applicant regarding:
  - i. expectations, duration, and performance standards,
  - ii. any special notes about the field, airspace, safety line, crash and recovery plan, etc.
  - iii. the importance of communication on the flight line and that there will be questioning and commentary while flying is taking place; and
  - iv. if asked to “land” the Applicant will comply or relinquish control to an Experienced Turbine Pilot. Any discussion or questioning as to why should be conducted after a safe landing.

#### **1.3.1 Evaluation of Turbine Ground Operation Skills**

The following skills are to be demonstrated through action along with verbal discussion where appropriate:

- a) The Applicant shall have a “B/C”-rated or equivalent fire extinguisher present for all engine starts. The Applicant shall ensure that water-based fire-fighting equipment is present on the field.
- b) The Applicant shall explain the potential for a post-crash fire and the response plan. *Explanation to include the fire department contact number and firefighting equipment immediately available for the modeler to respond to the fire.*
- c) The Applicant shall explain and demonstrate:
  - i. General knowledge of turbine setup. *Explanation to include the performing ECU learn the failsafe settings.*
  - ii. Fueling/de-fuel the model. *Explanation to include ensuring that the manual shut-off valve is closed, avoiding fuel spillage from the fueler or from the model fuel tank vents, ensuring the tanks are evenly/completely filled/emptied, prevention of over-pressurizing/collapsing the tanks by leaving any plugs installed during fueling/defueling or by having too high a speed on the fueling pump.*

- iii. Performing the startup. *Explanation to include examination of the startup area, orienting the model such that the exhaust gases do not impinge on people or any flammable object, ensuring that nobody is standing in-line-with or aft-of the turbine wheel (potential for throwing a turbine blade during startup) as well as the items to be performed to the transmitter/model to start the turbine.*
- iv. What to do in the event of a failed start attempt where fuel has flowed to the engine but has not been ignited (avoiding a potential hot start during the subsequent start-up). *Explanation to include that after multiple attempts the turbine should be removed from the airframe and tilted to drain any excess fuel from the front of the engine.*
- v. What to do if a hot start occurs. *Explanation to include the use of a blower, use of fire-fighting equipment, use of shutoff devices, potential for damage to the engine and/or model, inspection of the engine and/or model prior to any subsequent operation of the engine/model).*
- vi. What to do if an in-flight fire occurs. *Explanation to include shutting down the turbine immediately, not turning in towards the pits, and getting the model on the ground as quickly/safely as possible.*
- vii. How to perform an emergency shutdown. *Explanation to include: using the manual shutoff, the transmitter-controlled shutoff, turning off the model, or using the radio system failsafe by turning the transmitter off.*
- viii. Performing the shutdown and cool-down procedures. *Explanation to include orienting the model such that the exhaust gases do not impinge on people or any flammable object, pointing the model's nose into the wind during cool-down, and use of a blower.*
- ix. Typical turbine maintenance. *Explanation to include replacement of starter motor o-rings, replacement of glow plugs/igniters as applicable, monitoring total running time and returning the turbine to the manufacturer for scheduled maintenance, examination of compressor and turbine wheel for foreign object damage, fault isolation using GSU error messages, and inspection/cleaning/replacement of fuel filters.*
- x. The effect turbine lag on flight characteristics of the model. *Explanation to include effects on taxiing, take off roll, landing approach, and go-around decision point.*

### **1.3.2 Evaluation of Turbine Flight Skills\***

The Applicant shall operate the model solo (without a buddy box) and perform the following maneuvers:

- a) Takeoff. *Model to be held within 10 feet either direction of centerline, with smooth, controlled corrections as necessary.*
- b) Horizontal Figure 8. *Applicant to hold altitude to within +/- 50 feet during the Figure 8. This demonstrates skills at both left and right-hand patterns and the ability to control the model's flight path.*
- c) Perform two aerobatic maneuvers with combined looping and rolling elements to be selected by the turbine Applicant. Examples include Cuban 8, Humpty Bump with ½ roll, or similar maneuvers. *This demonstrates the general flying skills of the Applicant.*
- d) High Speed Circuit of the field performed at a safe high rate of speed. *This demonstrates the Applicant's ability to control a model aircraft at speed.*
- e) Square Traffic Pattern including a missed approach go-around. This maneuver to be in the opposite direction of the takeoff and landing if conditions allow. *This demonstrates the Applicant's ability to control a model aircraft in the landing approach mode.*
- f) Landing to a complete stop. *Smooth, controlled corrections to the model's path after touchdown are required. The landing must be completed on the runway.*

\* At no time during the flight shall the model pass behind the designated safety line.

#### **1.4 Post-Qualification Flight Debrief**

Following completion of the Qualification flight(s):

- a) The Supervising Pilots shall debrief the Applicant by discussing the outcome of the flight(s), any areas that need improvement, and answer any questions by the Applicant
- b) If the Applicant is successful in performing the qualification flight, the Supervising Pilots shall:
  - i. Complete and sign the attestation sections of the Turbine Waiver Application
  - ii. Remind the successful Applicant that:
    - a. He/she must submit the completed Turbine Waiver Application to the AMA via mail or email.
    - b. The completed/signed Turbine Waiver Application may be used as proof of waiver status until the AMA provides an updated membership card (on which is printed the waiver status).
    - c. The first five flights following a successful Qualification Flight:
      1. shall be supervised by an Experienced Turbine Pilot who shall be instructed on how to perform an emergency shutdown of the turbine in flight from the pilot's transmitter and be empowered to shut the turbine down in flight in the event of a loss-of-control emergency.
      2. Airspeed shall be maintained under 175 mph.
      3. Turbine flights shall be limited to single turbine engine aircraft.



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## **Section 3 - AMA Fixed Wing Turbine Waiver Application**

### **Applicant Information**

I, \_\_\_\_\_, state as follows:

Name of Applicant

1. I am currently a member in good standing of the Academy of Model Aeronautics.
2. I have accomplished at least 50 flights of a high-performance model as defined by Section 24 of the AMA Gas Turbine Waiver Program (AMA document 510a).
3. I am familiar with the requirements of the AMA Gas Turbine Program (AMA document 510a).

\_\_\_\_\_  
Signature

\_\_\_\_\_  
AMA Number

\_\_\_\_\_  
Date

**Prior to the Turbine Applicant Qualification Flight, the Applicant must have completed a buddy box flight, of the aircraft to be used during the Qualification Flight, under the supervision of one of the Experienced Turbine Pilots who will supervise the Qualification Flight.**

### **Attestation by Experienced Turbine Pilot**

I, \_\_\_\_\_, am currently an Experienced Turbine Pilot (as defined  
Name of Experienced Turbine Pilot  
by the AMA Gas Turbine Program) and have a turbine waiver on file with the Academy of Model Aeronautics.

I hereby attest that \_\_\_\_\_ has successfully performed the Turbine  
Name of Applicant  
Waiver Qualification Flight ground operation and flight skills detailed in Sections 1.3.1 and 1.3.2 of this document.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
AMA Number

\_\_\_\_\_  
Date

### **Attestation by Experienced Turbine Pilot with CD Status**

I, \_\_\_\_\_, am currently an AMA Contest Director and also an  
Name of Experienced Turbine Pilot with CD Status  
Experienced Turbine Pilot (as defined by the AMA Gas Turbine Program) and have a turbine waiver on file with  
the Academy of Model Aeronautics.

I hereby attest that \_\_\_\_\_ has successfully performed the Turbine  
Name of Applicant  
Waiver Qualification Flight ground operation and flight skills detailed in Sections 1.3.1 and 1.3.2 of this document.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
AMA Number

\_\_\_\_\_  
Date

Submit completed application (**Section 3 only**) via mail to AMA, Attn. Turbine Waiver, 5161 E. Memorial Dr., Muncie IN 47302 or email it to [turbines@modelaircraft.org](mailto:turbines@modelaircraft.org). Please plan accordingly! It may take up to 10 business days to process your application. Questions? Call AMA at (765) 287-1256, ext. 230.