

# Academy of Model Aeronautics

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## AMA Rules for Design, Construction, and Operation of Non-Production Gas Turbine Engines for R/C and CL Models

*Approved by AMA Executive Council (EC),  
on July 9, 2001,  
at the Board of Directors meeting*

### 1. Definition

- Non-production engine:** Any gas turbine engine built, all or in part, by the modeler himself/herself without subsequent certification by a kit manufacturer.
- ECU:** Electronic Control Unit, the electronic device that controls and monitors the engine's performance.
- EGT:** Exhaust Gas Temperature
- RPM:** Revolutions Per Minute

*These requirements apply only to owner/operated engines, i.e. engines fabricated under these rules are not authorized for production or re-sale!*

### 2. General

- A. The engine shall be built based on a known design, such as the KAMPS, the KJ-66, the MW54, or other engines as recommended by the Gas Turbine Builder Association (GTBA).
- B. All engines shall be controlled by an ECU with the following minimum control inputs: (1) an EGT sensor to monitor and control engine temperatures and RPM, and (2) sensor(s) for RPM and/or compressor pressure to monitor engine performance. The ECU shall be able to shut off the engine under normal usage and in the event of an emergency. A self-made ECU must possess the same characteristics.
- C. An auxiliary method (manual or electronic) of shutting off fuel flow during ground operations must be available independent of any function of the ECU (fail-safe or other function).

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- D. Any non-production engine involved in a crash or other high-stress incident, where damage is suspected or noted, shall be thoroughly inspected by the engine builder before the engine is returned to service. If there is doubt as to the potential damage, the engine shall be inspected.
- E. No non-production engine shall be operated in public until it has been thoroughly tested and shown to be safe.
- F. On multi-engine installations, all engines must be of similar design and must be controlled by ECU(s) of similar design and characteristics.

**3. Materials/Construction**

- A. No wood compressors are permitted.
- B. No non-commercial turbine wheels may be used. All turbine wheels shall be of commercial production and shall be accompanied by a written certificate from said manufacturer. Such certificate shall include the list of material standards to which the product complies and shall include the maximum recommended RPM for that wheel.
- C. Materials for construction of all components shall be appropriate for the intended purpose. Under no circumstances may a material of lesser capability be substituted for material called out on the plans. Materials with traceability should be best considered for use in the engine. Under no circumstances may markings of any sort be stamped onto finished rotating parts.
- D. Silver brazing shall be used inside the engine for all joints requiring soldering, such as fuel and oil manifolds.
- E. All high-temperature areas shall be made of the appropriate grade of stainless steel or better.

**4. Engine Limitation**

- A. No non-production turbine engine may utilize a turbine wheel greater than 68 millimeters in diameter.
- B. No non-production turbine engine may operate at a steady state EGT higher than 660 degrees Centigrade.
- C. No non-production turbine engine may operate at excessive steady state rotational speeds. Therefore, a non-production turbine engine with a 66 mm turbine wheel may not exceed 120,000 RPM and a non-production turbine engine with a 54 mm turbine wheel may not exceed 160,000 RPM. Under no circumstances may a commercial turbine wheel be operated at a steady state RPM greater than that recommended by the manufacturer.

**5. Engine Testing and Verification**

- A. Before any non-production engine may be flown at an “AMA field” or at an AMA sanctioned event, it must have been demonstrated to operate safely. Such a demonstration shall be simultaneously witnessed by both, an AMA CD and the holder of an AMA approved Turbine Waiver. Two individual witnesses are required. Upon successful completion of the demonstration, the witnesses shall complete the Non-Production Gas Turbine Safety Demonstration form, attached at the end of this document.
- B. Non-production engine safety demonstration shall include, as a minimum, no fewer than three consecutive full power ground (test standard) runs of at least eight (8) minutes continuous duration. The builder shall demonstrate the engine’s maximum steady state EGT, the maximum steady state RPM, and the ability of both the ECU and the auxiliary shutdown’s ability to shut down the engine in normal operating circumstances. Emergency (e.g., high EGT) shutdowns need not be demonstrated.
- C. During the demonstration runs, no vibration should be felt in the test stand, and there should be no foaming of the fuel and/or oil in tanks not damped in any way. If foaming exists, or if the engine makes unusual noises indicating a balancing issue, the engine must be rebalanced before the demonstration can be successfully completed. Additionally, there should be no flames exiting the exhaust during steady state operations, and RPM should appear steady.
- D. Both before the demonstration runs begin and after the runs are complete, the builder shall conduct, in the presence of the witnesses, a thorough inspection of the engine including the turbine wheel, all screws, all external welds, and all associated equipment including lines, and attach points.
- E. Should the non-production engine being demonstrated fail any portion of the prescribed testing, the entire test shall be considered to have failed, and the builder must reschedule another test session at a later date.
- F. Upon successful completion of the demonstration, the builder shall submit the completed form to the AMA for processing. The AMA shall issue a Non-Production Turbine Waiver for the particular engine whose tests were just completed. The non-production engine shall not be flown at an AMA chartered club field or at an AMA sanctioned event until such a waiver has been received.

# Non-Production Gas Turbine Engine Safety Demonstration

Name/AMA Number of Builder: \_\_\_\_\_

Name of Engine Design: \_\_\_\_\_

Detailed Description of Engine (type, size, plans followed, unusual characteristics or appearance):

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Turbine Wheel Diameter: \_\_\_\_\_ mm Wheel Manufacturer: \_\_\_\_\_

Manufacturer's Certification Present? (Y/N) \_\_\_\_\_ Max. Recommended RPM: \_\_\_\_\_

Date/Location of Demonstration: \_\_\_\_\_

Name/AMA Number of CD: \_\_\_\_\_

Name/AMA Number of Turbine Waiver Holder: \_\_\_\_\_

Start/Stop Time of First Eight Minute Run: (Start) \_\_\_\_\_ (Stop) \_\_\_\_\_

Max. Continuous EGT: \_\_\_\_\_ °C Max. Continuous RPM: \_\_\_\_\_ RPM

Start/Stop Time of Second Eight Minute Run: (Start) \_\_\_\_\_ (Stop) \_\_\_\_\_

\_\_\_\_\_

Max. Continuous EGT: \_\_\_\_\_ °C Max. Continuous RPM: \_\_\_\_\_ RPM

Start/Stop Time of Third Eight Minute Run: (Start) \_\_\_\_\_ (Stop) \_\_\_\_\_

Max. Continuous EGT: \_\_\_\_\_ °C Max. Continuous RPM: \_\_\_\_\_ RPM

Normal ECU Shutdown Okay (Y/N): \_\_\_\_\_ Aux. Engine Shutdown Okay (Y/N): \_\_\_\_\_

\_\_\_\_\_  
Signature AMA CD Witness

\_\_\_\_\_  
Signature AMA Turbine Waiver Holder Witness

Mail this form to: Academy of Model Aeronautics  
Special Services Department  
5161 E Memorial Drive  
Muncie, IN 47302

## **Addendum to Turbine Announcement**

Members that are interested in obtaining a waiver for a non-production engine will need to send in the following information:

1. One completed and signed copy of *Non-Production Gas Turbine Engine Safety Demonstration* form;
2. **Fixed Wing**
  - a. Signed and notarized *New Pilot Turbine Waiver Affidavit* – to be completed by Applicant;
  - b. Signed and notarized *Attestation* – to be completed by a current turbine waiver holder;
  - c. Signed and notarized *Attestation* – to be completed by a current turbine waiver holder who also holds Contest Director status;

OR

### **Rotary Wing**

- d. Two copies of *Contest Director Certification for Rotary Wing Aircraft* (one of these can be signed by the CD signing your Engine Safety Demonstration Form).
- e. Self-signed *Rotary Wing Turbine Waiver Pilot Declaration*;

### **Control Line**

- f. Two copies of *Contest Director Certification for Control Line Aircraft*;
- g. Self-signed *Control Line Turbine Waiver Pilot Declaration*

Please send all documents to AMA, Attn.: Amy Wilson, Special Services Department. Upon arrival, all signatures will be verified. Individuals applying for a turbine waiver should allow up to 30 days for review, processing, and receipt of the waiver. However, we may be able to do this in 10 working days.

Once all the information is processed, we will issue a “Non-Production Turbine Engine Waiver” and mail it to you. In addition you will receive a special numbered identification sticker that needs to be affixed to the specific engine, which was tested during the Safety Demonstration and signed for by the CD and Turbine Waiver holder witnesses.

Note: The waiver is the means by which we acknowledge that you, the AMA member, have met the requirements established by the AMA Executive Council approved regulations, and are provided liability insurance coverage for operation of a non-production turbine engine.

Please contact Amy Wilson at [amyw@modelaircraft.org](mailto:amyw@modelaircraft.org) or (765) 287-1256 ext. 252 for a complete application package.