MODEL FLYING NEW ZEALAND

Large Model Code of Practice

VERSION 8.4 NOVEMBER 2017

Version	Clause /Description/Changes	Date	Approved
5	Initial public Issue	Oct 2007	LM Sig MFNZ
6	Servo sizing revised	Sept 2008	LM Sig
7	2.4 GHz receiver criteria and MFNZ references	April 2010	LM Sig MFNZ
8.2	Revisions to definitions and servo requirements, wings requirements clarifications	August 2014	LM Sig MFNZ
8.3	Updated to comply with Part 102 processes	May 2016	MFNZ
8.4	Revisions to definitions, Cat 3 TP spec, Failsafe requirement, Rx and battery redundancy, test flight witnessing, Cat 2 secondary pilot testing, Inspection checklist. Revised definition public site to flying site. Revised Wings qualification requirement	Nov 2017	LM Co MFNZ

CONTENTS

1.0 FOREWORD

This code of practice has been prepared by MFNZ to satisfy its obligations as a Civil Aviation Authority of New Zealand (CAA) approved body for the certification of large models under their regulations and to promote the safe operation of large models in NZ for recreational and non-commercial use.

The key event that leads to risk associated with the operation of large models is loss of control. The consequences of loss of control are potentially more significant with heavier and more powerful models and this is recognised in the CAA regulations requiring certification of large models. This Code of Practice has been developed in recognition of those aspects of large model design, construction and operation with the potential to lead to a loss of control, with a view to practically minimizing the likelihood of this occurring. Other MFNZ rules and guidelines, around flying sites and separation distances for example, apply to mitigate the consequences should a loss of control occur. Adherence to the COP and MFNZ rules and guidelines thereby minimise the risk associated with the operation of large models.

Whilst every effort has been made to ensure that this Code of Practice (COP) is complete and error- free, MFNZ cannot be held responsible for any eventuality arising from its application. Therefore the use of this document is not in any way whatsoever a warranty, guarantee or assurance as to the safety or freedom from defect of the whole or any part of any model or its fittings or equipment, nor of the competence of any person who may fly it.

Safe operation of any large model remains the responsibility of the builder/owner and pilot of the model.

2.0 INTRODUCTION

The requirements of this Code of Practice should be read in conjunction with the MFNZ Members guide and prevailing CAA regulations.

Large models by nature require an understanding of model construction techniques by the builder of the model. Forces and stresses on airframes and control surfaces require greater consideration, including the adequacy of control linkages and servos, than those associated with smaller models. The prevalence of ARF type large models can make it difficult to assess structural integrity of an airframe and consequently this COP incorporates requirements in relation to such ARF models.

Pre-flight inspection checks play an important role in safe operation and have proven to have prevented dangerous situations from occurring.

The Large Model Certification Scheme is not only required for CAA compliance, it is a key element in the management of risk associated with our hobby.

Category 1 & 2 aircraft are a legal CAA requirement whilst Category 3 is managed by MFNZ as valuable safety precaution based on a powerful engine component.

MFNZ safety rules require that models within the categories 1, 2, and 3 above be certificated. The process for achieving certification in these categories is described in this COP.

Pilots of Categories 1, 2 and 3 must also hold an MFNZ LM wings qualification relevant to the aircraft type operated

To avoid confusion, it is noted that a long-standing association formed by MFNZ members also uses the term ‘Large Models’ to describe aircraft that satisfy a dimensional specification chosen by the group for rally-flying purposes, but are lighter than Category 1 and have motors smaller than Category 3. These models do not require certification, and the aspects of this COP that pertain to certification standards and procedures do not apply to them.

3.0 DEFINITIONS

CAA: Civil Aviation Authority of New Zealand

Inspector: A person appointed by the Large Model Controller to advise the owner of a project requiring large model certification and to approve, as appropriate, the model's design, construction and flight testing. Inspectors are appointed to projects on the basis of relevant knowledge and experience.

Large Models: Model aircraft that fall within the categories detailed below:

(a) Category 1: Models 15kg – 25kg with fuel

Authority is delegated to MFNZ by CAA to issue Permits to fly to owners of radio controlled model aircraft in the weight range 15kg – 25kg with fuel. It is illegal under NZ law for models of this weight to be flown without written permission from MFNZ.

(b) Category 2: Models 25kg – 100kg with fuel

(c) Category 3: Models less than 15kg but with IC motors 75cc, Turbines 130N or electric motors 5kW input or larger. Turbo props 5kW output or larger. It should be noted that multi engine aircraft are viewed as the total engine power not exceeding the above limits.

MFNZ: New Zealand Model Aeronautical Association (Incorporated) also known as Model Flying NZ

Flying Site: Any site that the pilot has assessed as compliant with the MFNZ members manual, is suitable for large model operation and has the site owners/operators permission.

Shall / must: Indicates an obligation to comply.

Weight: The weight taken is the gross weight of the complete model including fuel and any temporary fittings such as underwing stores.

4.0 OPERATION OF LARGE MODELS

A large model may be flown only if it has been certificated under the Large Model Certification Process (see Section 6) or as part of the certification process.

Pilots must be under the direct supervision of a LM certified pilot when undertaking training flights. It is permissible to use a buddy box system when undertaking training flights only.

All large models shall be checked before the first flight of the day. The Pre-Flight Checklist in Appendix 1 specifies the checks that shall be undertaken prior to the first flight of the day. The inspection may be carried forward to subsequent days of a flying rally. The inspection check shall also be undertaken subsequent to any incident / accident – no matter how minor.

Pilots of large models need to consider the restrictions posed by a particular flying site and the weather conditions, and therefore it's suitability for the large model they are intending to operate and only proceed to operate the model if it can be done safely.

Pilots must hold a Wings Qualification rating with a supplementary LM endorsement for the relevant model category.

The rating categories are:

HP (heli), TJ (turbine), BP (fixed wing power), GD (glider), MR (multirotor)

Note: All LM ratings must be flown with a Category 1, 2 or 3 certified aircraft.

Example: pilot with BP rating sits LM theory test completes one flight test with cat 1, 2 or 3 aircraft result = BP (LM) rated.

Refer to Wings Qualification scheme at www.modelflyingnz.org for further details.

Motors shall be disabled when models are in the pits. Battery ignition systems shall be switched off and glow plug circuits disconnected when the model is unattended. Electric powered models shall have the batteries supplying the motor disconnected when in the pits.

There shall be a means to stop all motors from the transmitter.

All categories must have a radio fail safe active during model operation. Physical demonstration of this function may be required during pre-flight or event registration inspection. Failsafe function will require as a minimum the engine, turbine or electric motor reducing to idle power.

5.0 LARGE MODEL – CRITERIA FOR MODEL DESIGN, CONSTRUCTION, AND EQUIPMENT

5.1 General

The fundamental criterion is that a Large Model must be as safe as practically possible to operate. The standards of design, engineering and construction must be appropriate and adequate for the chosen technologies and materials, power, and model type. In this context, current best practice is desirable and is determined by reputable published plans, current publications by knowledgeable authors, reputable kitset manufacturers, and the knowledge and experience of people recognised by MFNZ.

5.2 Design

Where designs are to be utilised that are not known or recognised they may be assessed by comparison to existing proven designs for comparable airframes in terms of size, weight, materials, construction techniques and potential performance. Where no such comparison is available the design may be qualified by analysis of the loads that will be applied to, and load bearing capacity of, the proposed structure.

5.3 Construction

Construction shall be assessed based on the quality of the materials used, the techniques employed to ensure adequate strength at joints as well as the accuracy and workmanship as they affect the ability of the airframe to perform as intended.

Control surface hinging, engine, undercarriage, as well as servo and other mounting systems shall be assessed for appropriate strength and rigidity.

5.4 Equipment

Receivers: Two receivers and redundant power supplies for receivers and servos are mandatory for Category 2 models and are strongly recommended for Category 1 and Category 3. This requirement can be met in either of three ways:

(a) **Option 1**: A primary receiver accompanied by one or more linked satellite receivers, with two or more power supplies linked either directly to the primary receiver or to a junction box that regulates power to the receivers and servos.

(b) **Option 2**: Dual independent receivers, each with its own servos and power supply, which share each of the primary controls of the aircraft. For example, one receiver would drive the port aileron and the second would drive the starboard aileron. Similarly, each receiver would control half of a separated elevator surface or each would control one of two servos that are ganged to a single elevator surface.

(c) **Option 3**: Multiple independent receivers powered with dual batteries via an electronics power distribution system. The receivers in turn connected to a multiple input/multiple servo output device capable of distributing servo power and output data to independent or ganged servos. The receivers could be connected to the output device via serial bus.

For example: two Futaba receivers connected to a Power Box Royal SRS or Power Expander SRS.

(d) It is recommended that a full evaluation of any proposed receiver system be undertaken prior to consideration for use in terms of this COP.

5.5 Flight Batteries

Redundant (dual) flight batteries are mandatory and may be provided by use of:

(a) Separate battery inputs to the receiver via a dual battery redundancy unit.

(b) A junction box unit that regulates dual power supplies to receiver(s) and servos.

(c) A single receiver input via a suitable electronic dual battery redundancy unit that meets the servo current loading.

The total battery capacity shall take into account the number and power of the servos, the required control movement, the size and speed of the model together with the expected number of commands to be exercised in flight. It is recommended that an individual battery capacity of at least 2000 mAh be utilized and that the battery chemistry allows for high current capacity under load.

5.6 Servos

The servos installed for control surface operation should be a minimum of the following:

(a) Manufacturers recommendation for the particular model aircraft, or

(b) Specifically calculated for the given control surface and aircraft performance

Written documentation is required to the satisfaction of the Large Model Inspector justifying the servos selected for Category 2 models and may be required for Category 1 and 3 model

Servo extension leads shall be selected consistent with the current draw that the servo is capable of, the length of the lead and its associated voltage drop under load. This consideration also applies to battery leads. This requirement will usually mean that heavy duty servo extension leads are required. Consideration should also be given where appropriate to separating ancillary electrical systems from primary flight control power.

5.7 Control Linkages

All control linkages, clevises and horns shall be able to withstand the maximum torque output of the servo. When selecting the type and design of pushrods, consideration should be given to the likely forces that will be imposed on the control surfaces, to ensure that bending of pushrods and/or un-commanded deflection of control surfaces does not occur.

Where pushrods/clevises are used for primary control surfaces, the minimum size shall be 4–40 (or 3mm). Pull/pull systems are recommended where appropriate. For large aerobatic models, specialized heavy- duty linkages, servo arms, and hinges are recommended.

Heavy duty hinges are recommended for all control surfaces and careful attention to the required number of hinges in each control surface to ensure control surface integrity in relation to the likely loads on the control surface during flight. All hinges shall be 'pinned' in such a manner to prevent control surface separations. Robart hinges are acceptable.

6.0 LARGE MODEL CERTIFICATION PROCESS

6.1 The Certification Process

This has three sequential parts, Part A, Part B, and Part C, as follows:

6.2 Part A: Registration of Project and Appointment of Inspector

The Owner of the project applies to the Large Model Controller for registration of the project, using Form A. When the Large Model Controller registers the project, it arranges for an Inspector who will then work with the Owner, and informs both the Owner and the Inspector, with contact information. It is then the responsibility of the Owner to contact the Inspector and so proceed to Part B.

6.3 Part B: Certification of Design and Construction and Permit to Flight Test

The Inspector appointed in Part A records inspection and approvals of the aircraft design and construction, using Form B, which is signed by both the Owner and the Inspector when construction has been approved.

Approval of construction will normally require a minimum of three inspections:

(a) Inspection 1: assessment of project intentions/plans

(b) Inspection 2: assessment of construction while internal structures are accessible/visible

(c) Inspection 3: assessment of the model presented ready for flight.

At the discretion of the Inspector, or request of the Owner, further inspections may be undertaken at any stage during construction.

6.4 Part C: Approval of Flight Testing and Permit to Fly

The Categories have different processes, as follows:

(a) **Categories 1 and 3**: The model is eligible to commence flight testing as soon as both the Owner and the Inspector have signed Form B, but before sending it to the Large Model Controller. Upon receiving Form B, the Large Model Controller will issue to the Owner a **Certificate of Design and Construction** and a confirmation of Authorisation to Flight Test. A copy will be sent to the inspector.

(b) **Category 2**: Flight testing requires prior approval in writing from the Large Model Controller. The Controller will arrange this as soon as Form B is received signed by the Owner and Inspector. The Authorisation to Flight test will be sent to the Owner and Inspector by the Large Model Controller together with a Certificate of

Design and Construction. Flight testing may commence only after these documents have been received.

6.5 Flight Testing

This must be completed within one year of the Certificate of Design and Construction being issued. Upon issue of the Approval to begin Flight Testing, the aircraft must be marked with the Large Model registration number. This marking must be in an area which is easy for a witness to see, preferably in the cockpit area but scale models may be marked in the wing opening or behind a hatch.

(a) Flight Testing may take place at flying sites as defined in this COP. If this site is adjacent to a full-size airfield, testing shall not take place while full-size aircraft are active.

(b) The personnel present at Flight Testing must be limited to the Owner, Pilot, Inspector/Witness, and essential helpers. No spectators are permitted on the flight line and no other flying may take place while Flight Testing is in progress.

All other flight safety standards and rules established by MFNZ must be observed.

6.6 Witness

All flights must be witnessed by the Inspector or a person appointed by the Large Model Controller, the witness MUST be a current member of MFNZ. It is the responsibility of the Witness of each flight to ensure that all the requirements of the Flight Test Log (see below) are met, and that the flight is signed off.

(a) **Flight Test Log:** Approval of Flight Testing requires completion of the Flight Test Log (Form C). The Witness of each flight should include brief notes about the performance of the model and pilot, if appropriate. By signing the Log, the Witness confirms that the model appears to be safe to fly at the place and in the weather conditions noted. The Witness should take care that this confirmation is carried out accurately and without fear or favour.

6.8 Flight Testing Requirements

These are different for the Categories as follows:

(a) **Categories 1 and 3:** The model will complete 5 flights with all chosen manoeuvres completed on every flight. If all manoeuvres are not completed, the flight cannot be counted. The manoeuvres listed in the Flight Test Log must demonstrate the integrity and controllability of the model in the entire envelope in which it is intended to be flown.

(b) **Category 2:** The completed Flight Test Log must total a minimum of one hour flying time with all chosen manoeuvres completed on every flight. If all the manoeuvres are not completed within the flight it cannot count for the Log. The flying time must be completed in not less than 6 flights and each flight

must demonstrate controlled start up and shut down of all engines and the radio. It is stressed that one hour is the absolute minimum and it is likely that it will take longer than this to satisfactorily complete the test programme. Any requirements for modifications to the model that are identified during the test programme shall be carried out and this may mean further testing is required. It is expected that for unusual or complex types of model new to the pilot, the test programme will be extended.

(c) **Additional Pilots**: Whenever the owner seeks certification of the model when flown by another pilot, a further Flight Test Log must be completed. This Flight Test Log must record completion by this new pilot of at least one hour flying time that include all of the chosen manoeuvres.

(d) **For all Categories:** The Flight Routine specified in the Log of Flights must be approved in advance by the Inspector and must include demonstration of all control functions and manoeuvres that are intended to be flown under the Permit to Test Fly. At the discretion of the Owner or Pilot, prior flights that are not eligible for the Log may be undertaken to establish control settings and flight envelope. It is expected that the Log will be completed over a period of time and not in one day. Witnesses should ensure that the model can be operated in a variety of weather conditions and not only on a "nice" day.

6.9 Pilots

The requirements concerning pilots differ between the Categories, as follows:

(a) **Categories 1 and 3**: Flight testing may be undertaken by any pilot holding a Wings Qualification with LM endorsement for the relevant model category refer to Section 4.4 of this COP for details. Any such qualified pilot may operate the model when it has a Permit to Fly. The Permit to Fly for Category 1 and 3 models will be valid for a period of no more than five years. All flights must be recorded in the owner's logbook.

(b) **Category 2**: The aircraft and pilot are tested and certified as a combination. Thus, a separate and new Flight Testing programme is required for each pilot that the Owner registers to fly the aircraft as specified in Flight Testing Requirements. The Permit to Fly is limited to a specified pilot, who has operated the aircraft throughout Flight Testing. A separate Permit to Fly is issued for the aircraft with each pilot who qualifies the aircraft through completing a Flight Testing programme.

Pilots must hold a Wings Qualification rating with a supplementary LM endorsement for the relevant model category.

Permit to Fly: When Flight Testing has been completed, the Inspector will verify that the aircraft remains airworthy, and will then complete and sign Form C.

Upon receiving the completed and signed Form C with attached Flight Log, the Large Model Controller will issue to the Owner a Permit to Fly, which authorises the aircraft to be flown, subject to the 'Pilots' specification above, at any flying site as defined in this COP, subject to the Large Model Controller reserving the right to limit the operation of Category 2 aircraft to specifically designated sites. The Permit to Fly for Category 2 aircraft will be valid for a period of no greater than three years. All flights must be recorded in the owner's logbook.

For Category 2, the permission obtained from the Large Model Controller prior to Flight Testing remains the primary permit, to which the MFNZ Permit to Fly is added after completion of Flight Testing.

A Permit to Fly remains valid only if the Owner maintains the aircraft in the state of airworthiness that existed at the time of the Permit being issued. Aircraft that hold this Permit must be re-inspected when required by the Large Model Controller, which may decline to renew the Permit.

At its own discretion, the Large Model Controller may suspend or cancel a Permit on the grounds that the aircraft (and the Pilot in the case of Category 2) no longer reaches the necessary standards. It is the responsibility of all Pilots of Category 2 aircraft to advise the Large Model Controller of any events or occurrences that may limit their piloting capabilities. In the event of a mishap requiring substantial repairs, the Large Model Controller may require repetition of Part B and/or Part C. It is the responsibility of the Owner to advise the Large Model Controller of any such mishaps.

6.10 Special Cases: Completed, Semi-Completed and ARF Aircrafts

If an Owner registers a project when it is already completed to apparent flight condition, semi-completed, or as an Almost Ready to Fly (ARF) kit, the above process will still be followed. Within Part B, it is likely that the Inspector will proceed directly to either Inspection 2 or Inspection 3. In cases where internal construction is not visible the Inspector will be obliged to rely on information provided by the Owner, such as plans and/or the specifications and manuals provided by ARF manufacturers. The acceptability of such evidence is at the sole discretion of the Inspector; if the information available is insufficient to make responsible judgments at Part B, construction will not be approved and no authorisation to Flight Test will be issued.

The risk of such an outcome is borne entirely by the Owner. At the discretion of the Inspector, the Owner may be given the option of removing specified parts or structures so that an appropriate inspection may take place.

Under all circumstances, an aircraft acquired by a new Owner will be required to undertake Part A Registration of Project and Appointment of Inspector and Part C Approval of Flight Testing and Permit to Fly. Details of current and new owner should be lodged on the Change of Ownership form available on the MFNZ website.

Where the specification of the aircraft has changed from that originally inspected, for instance the removal of the engine or control equipment, the Part B, Construction Inspection checklist must be repeated

APPENDIX 1 – INSPECTION CHECKLIST

Pre-Flight Inspection
MFNZ Large Model Scheme

Date: _____

Model Description: _____

Large Model Registration No: _____

CHECKLIST	Accept	Reject	Recheck
GENERAL APPEARANCE – overall appearance			
(Check for damage, warps, loose covering etc.)			
PROPELLER – secure (check for cracks, damage)			
ENGINE – Securely attached (including muffler)			
ENGINE KILL – to prevent accidental starting (Ask if able to kill with radio)			
LEFT WING – Attachment secure			
LEFT WING – Aileron hinges secure			
WING – Control link keeper			
LEFT WING Control pushrod stiffness			
ELEVATOR – Hinges secure			
ELEVATOR – Control link keeper			
ELEVATOR – Control pushrod stiffness			
RUDDER – Hinges secure			
RUDDER – Control link keeper			
RUDDER – Control pushrod stiffness			
TAIL SURFACE – Brace wires secure			
TAIL SURFACE – Brace wires keepers			
RIGHT WING – Attachment			
RIGHT WING – Aileron hinges secure			
RIGHT WING – Control link keeper			

CHECKLIST	Accept	Reject	Recheck
RIGHT WING – Control pushrod stiffness			
Hatches or Covers – Secure			
Wheels and Landing gear – Secure			
BATTERIES FULLY CHARGED – Ask			
WEIGHT & BALANCE – Any changes since approved?			
Radio Checks			
Transmitter Battery			
Range Check and confirm Failsafe operation.			
Control directions			
Crystal-based frequency and peg correct			
Synthesized module Setting checked against frequency peg			
Frequency selectors sealed with sticker			

AUTHORIZATION:

I certify that the above described aircraft has been inspected pursuant to the Large Model Code of Practice.

INSPECTED BY…….MFNZ No:……..