A FRAMEWORK FOR THE DEVELOPMENT OF MAASA SCHEDULES

FOREWORD:
With thanks and appreciation to the NSRCA Pattern Sequence Development Procedure document for ideas, structure and detailed thought that has gone into their document and which has been shamelessly copied and simplified for our use.

REVISION HISTORY

Version	Date	Author	Description
V0.1	24/06/2013	Grant Brook	Initial draft of document
V0.2	25/06/2013	Grant Brook Clinton Carter-Brown	Submitted to MAASA committee for approval.
V0.3	14/07/2013	Grant Brook Clinton Carter-Brown	Minor changes following from new schedules developed
V1.0	12/08/2013	Grant Brook Clinton Carter-Brown	First Issue
V2.0	28/08/2015	Grant Brook Chris O'Connell	Second Issue Updated to remove intermediate class

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1. PURPOSE OF DOCUMENT

The purpose of this document is to set guidelines for the development of flight schedules for the precision aerobatic Sportsman, Intermediate and Advanced classes in South Africa. Furthermore the document will set out the development goals for each class to allow pilots to self assess their progress and to focus on specific aspects of their flying that can be improved.

The schedules used by the Masters class and F3A class will continue to be defined by the FAI F3A Preliminary and Semi-Finals schedules as implemented by the FAI every second year.

2. APPROACH

The guidelines will determine a process for establishing the schedules for the two classes in such a way as to ensure a balance between pilot's capability when entering the class and the intended proficiency to be gained before moving to the next class.

The guidelines also consider the equipment needed to fly the required schedules and are aimed at allowing a cost effective entry to precision aerobatics with constant improvement in skill and equipment.

Each class is assessed separately under the following subsections: Primary purpose, Airframe considerations, Design considerations, Sequence structure and boundaries. The purpose of the Masters and F3A class is included, even though the schedules are pre-defined, so as to complete the development process.

GENERAL DESIGN CRITERIA

a. A flight schedule should be designed to provide a logical and progressive development of a pilot's proficiency, precision and skill.
b. The Sportsman class is to be considered as both an introductory and developmental class that allows the pilot to learn the basic manoeuvre elements for precision aerobatic piloting skills.
c. The Advanced class should build on the basic elements to progressively increase the degree of difficulty.
d. The Masters class is a destination class for National competition as well as a training ground for pilots wishing to compete in the F3A class. The Masters class will use the FAI F3A Preliminary schedule.
e. The primary goal of this framework is to ensure a logical and seamless progression during the transition from Sportsman class to Masters Class.
f. The following general criteria must be adhered to when creating new sequences:
    - Visibility of manoeuvres to aid in consistent judging.
    - First manoeuvre must be upright entry, into wind.
    - Last manoeuvre must be upright exit, into wind.
    - Single box entrance and exit for Advanced.
    - Building block approach between classes.
    - Manoeuvre quantities established to get desired flight times.
    - Increase in flight times through the classes.
    - Select manoeuvres to support reasonable transition to the next class.
    - Establish Key manoeuvres for each class to aid in determining the readiness of the pilot to transition to the next class.
    - Increasing level of difficulty and complexity.
    - Minimum and maximum K-Factor defined for each class.
    - Increasing degree of pilot proficiency required.
    - Combinations of manoeuvres that make it possible to fly the schedule with precision, smoothness of presentation and a continuous flow and enhance the consistency of judging.
    - Sportsman class is an introductory class as well as a basic skills development class.
    - Advanced class is designed to provide progressive development of pilot's skills to assist them to reach the Masters class.

3. DESIGN PROCESS

- Identify candidate centre manoeuvres.
- Identify compatible turnaround manoeuvres.
- Identify manoeuvres with the desired individual levels of difficulty.
- Check manoeuvre quantities and total K-Factor against the requirements.
- Revise centre manoeuvres as needed and revise turnaround manoeuvres accordingly.
- Adjust difficulty of selected manoeuvres to meet the total requirements.
- Ensure good flow from manoeuvre to manoeuvre and for the overall sequence.
- Test fly to find problems.

- Revise as needed to develop a preliminary version for approval by the MAASA committee.
- Finalize changes and publish results.

4. SPORTSMAN CLASS

Sportsman Class is considered as both an introductory and development class that provides for learning of basic manoeuvre elements and precision aerobatic piloting skills.

The primary purpose of this Class is to develop a pilot's proficiency and skills to:

- Fly straight and level lines
- Fly straight path parallel to the flight line and within the 140m to 170m corridor
- Maintain wings level attitudes
- Fly straight vertical lines
- Understand /fly accurate Up and Down Line angles
- Safely fly basic inverted flight
- Develop understanding of manoeuvre geometry
- Properly position manoeuvres (Centre and Turnaround)
- Perform standard Takeoff and Landing manoeuvres
- Perform basic Aerobatic manoeuvres with precision
- Fly proper entry/exit lines for manoeuvres
- Learn centering of basic elements within manoeuvres.
- Become comfortable with multiple manoeuvre sequences and flow
- Support simple multiple control input manoeuvres (elevator timing-rolls)
- Be introduced to the Turnaround environment
- Become familiar with flying in a judged and competition environment

Airframe Considerations

- Airframes utilized will be average powered .40 to .60 size sport aerobatic types with a maximum of 90 size glow motor or 8S (33.6volt fully charged) electric propulsion. Many of these models may not be well trimmed.

Design Considerations

- Difficulty should be very low. Only K1 and K2 manoeuvres utilized.
- Manoeuvres chosen teach wings level.
- Teaches some basic airplane trimming. Trim demands are low. Mostly trim tabs on the transmitter.
- Maybe a little CG and control surface throw rate adjustment.
- Vertical manoeuvres should not be power demanding. Should be able to be performed with a sport aerobatic model as defined above.
- Safely teaches use of down elevator.
- Sequence is arranged to give more time in places to setup up for the next manoeuvre in the sequence.
- Allow for up to at least a total of four box entries and exits.
- Stall turns should be upwind.
- Focus is on lines and shapes but no real rudder needs.
- Must introduce some rolling up high and safe.
- Any inverted flight should be up high (i.e. Double Immelmann without rolls)
- Repeating manoeuvres for reinforcement of a skill.
- Sequence maintains a turnaround look. Not only centre manoeuvres.
- Goal is for a total sequence K-factor around 24.

- Goal is 12 figures total excluding Takeoff and Landing.

Sequence Structure and Boundaries

The following criteria define the structure and boundaries to be adhered to in designing a balanced Sportsman sequence covering the required skill sets:

- Manoeuvres (K-factors of 1 and 2)
- Total K-Factor range: 22 to 26.
- Entries and exits for manoeuvres shall be upright.
- Minimum of three box entries and exits,
- Required centre manoeuvres:
    - Double Immelmann without Rolls
    - Straight Flight Out and Straight Flight Back
    - One horizontal roll
- Required turnaround manoeuvres:
    - Immelmann Turn
    - Split "S" (half roll, half loop from top)
    - Half Cuban Eight and/or Half Reverse Cuban Eight
- Required at least one manoeuvre from each of the following families of manoeuvres:
    - Loops (single or superimposed)
    - Stall turns (upwind)
    - Half loops
    - 45 degree up and Down Line

5. ADVANCED CLASS

Advanced is the next class following Intermediate in the progression of R/C Precision Aerobatic classes. Advanced is where the skills presented in Sportsman and Intermediate are further reinforced with more added complexity and new pilot skills are presented to teach the pilot the necessary skills required to successfully fly Masters and to some extent F3A. The pilot is honing his/her skills in the full turnaround environment with precision, presentation and flow.

The primary purpose of this class is to develop a pilot's proficiency and skills to:

- Fly straight and level wind corrected paths with incorporated manoeuvres
- Fly straight path parallel to the flight line and within the 140m to 170m corridor.
- Center manoeuvres in up and down lines and angles
- Fly straight wind corrected up/down vertical lines with incorporated manoeuvres
- Fly accurate angles in up/down lines and manoeuvres
- Properly position manoeuvres (centering and turnaround locations)
- Perform more complex combinations of manoeuvres and elements
- Perform manoeuvres (center and turnaround) with inverted entries and exits
- Fly proper entry/exit lines for manoeuvres
- Perform rolling manoeuvres at slower rates to learn multiple stick inputs
- Capability to maintain constant track (CG) of the aircraft in all attitudes
- Perform multiple manoeuvre sequences in the box
- Perform more complex multiple control input manoeuvres (i.e. snaps and spins)
- Develop a feel for precision and flow of the total sequence
- Understand the need for presentation and flow to obtain better scores

Airframe Considerations
Airframes utilized will typically be older designs 2x2's through current state-of-the-art F3A level models and designs.

Design Considerations

- Build on the skills developed in Sportsman utilizing K1, K2, K3, and introducing some K4's to build the skills to prepare the pilot for the next class - Masters.
- Need for building the skills first - both airplane trim and flying skills
- Start utilizing more complex loop-roll combos including hesitation rolls beyond 1/2 rolls.
- Introduce basic snaps and spins. Make them easy as this is the introduction. Single snaps and full rotation spins, upright snaps and spins, but could have Avalanches that are optional positive or negative.
- Centering skills and box management for turnarounds. This includes correction manoeuvres after snaps and spins.
- Utilize more complex turnarounds except some of the more complex snap, spin and figures. Complex but still maintains some sense of recovery from a poor manoeuvre.
- More inverted flight pushing out of figures but not a lot of inverted entries and exits at the bottom of the box.
- Inverted to inverted rolling should primarily be kept up high (i.e. triangle loop with full roll inverted to inverted)
- Rudder work increases to finesse rudder like slow and hesitation rolls
- Not too power hungry or airplane demanding manoeuvres like in F3A and Masters.
- Utilize mainly basic shapes (Triangles, Polygon loops and squares) that build rudder skills.
- Adding rolls to them to teach the switching of rudder inputs as the model rolls in vertical and horizontal components.
- Introduce upwind and downwind correction elements like the downwind stall turn. However, at this new element level - keep it simple to build the skill.
- Goal is for a total sequence K-factor around 45.
- Goal is 17 manoeuvres total excluding Takeoff and Landing.

Sequence Structure and Boundaries
The following criteria define the structure and boundaries to be adhered to in designing a balanced. Advanced Sequence covering the required skill sets:

- Total K-Factor range: 43 to 47.
- Total manoeuvres (excluding Takeoff and Landing): 17.
- The sequence shall have only one box entry and exit.
- No more than one of the same family of manoeuvres used in the sequence as a center manoeuvre. Exceptions to this requirement are stated below.
- No more than two of the same family of manoeuvres used in the sequence as turnarounds (i.e. no more than two stall turn variants or half square loop variants). Humpty bumps shall be the exception with a maximum of three when one is being used as a cross box manoeuvre.
- Maximum of two cross box manoeuvres.
- Minimum of two but no more than three downwind horizontal rolling manoeuvres. Two of these manoeuvres are required to be the Slow Roll and Four point roll.
- Minimum of one but not more than four manoeuvres with a K-factor of 4.
- Minimum of two but not more than four stall turns. Maximum of two turnaround stall turns. One downwind turnaround stall turn is recommended. Maximum of two

turnaround stall turns in conjunction with one double stall turn type center manoeuvre (Double stall turns).
- Maximum of one inverted exit and one inverted entry to/from inverted flight at low altitude on turnarounds. No turnaround shall have both an inverted entry and exit.
- Maximum of two positive snap rolls. Exception is Avalanches which are optionally positive or negative.
- Maximum of one positive upright spin (center manoeuvre).
- Maximum of one manoeuvre that incorporates two reversing half rolls with immediate reversal.
- Reversing half rolls can be on horizontal, 45 degree line or vertical line.

6. MASTERS AND F3A CLASSES

Definition
Masters is the destination class in the progression of National R/C Precision Aerobatic Classes. Masters is where the skills built on in Sportsman through Advanced are now applied. Masters also functions as a development class for F3A from which the national team is selected for international participation.

The primary purpose of this class is to develop and demonstrate a pilot's proficiency and skills to:

- Fly straight wind corrected vertical lines with centred manoeuvres
- Fly with required geometry and accuracy of the manoeuvres
- Fly accurate angles in all manoeuvres
- Properly position manoeuvres (centering and turnaround locations)
- Perform standard Takeoff and Landing manoeuvres
- Perform combinations of difficult/complex precision manoeuvres in the box
- Fly proper entry/exit lines for all manoeuvres
- Fly constant entry/exit radii for all manoeuvres
- Properly position all elements within a manoeuvre (centering in lines)
- Maintain constant aircraft track parallel to the runway in all conditions
- Perform the sequence gracefully with consistent flow and precision

The Masters and F3A schedules will comply with the current FAI F3A Preliminary and Semi-Final schedules