

F 2 C NOISE TEST

REPORT

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1. SCOPE

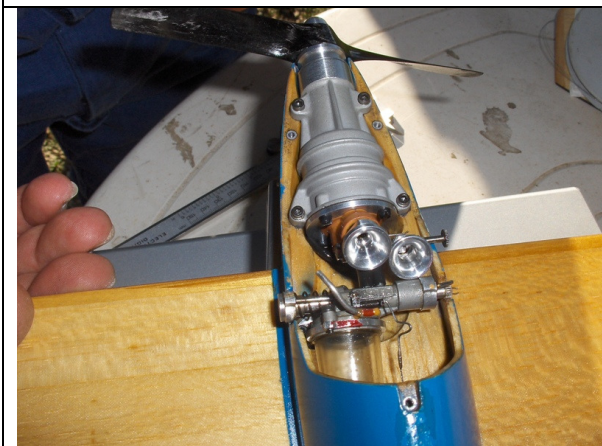
Scope of the present document is to provide FAI -CIAM Boureau and F2 Subcomitee evidence of the Noise reduction applying the Venturi Size reduction to 3 mm diameter, trough data measurement and comparison on a standard F2C Team Racing model in order to support proposal of Muffler Rules Cancellation.

As e second effect of the Venturi reduction to a 3 mm diameter, F2C Team Racing model will reduce their flight speed with an increase of the safety of the competitions.

2. TEST EQUIPMENT

For the execution of the test the following test articles are used:

- F2C Standard Model
- Zalp Standard Motor
- 6 x 6 3/4 propeller
- Sound Level Meter SL-5868T with Bluetooth interface
- HP Pavillon DV8000 Personal computer for data collection
- Stopwatch 1/100 accuracy





In annex 1 is provided the user manual of the Sound Level Meter

3. TEST PROCEDURE

In order to fulfill the purpose a different sequence of test will be carried out as described following:

3.1 TEST 1 (BLANK NOISE MEASUREMENT)

- STEP # 1 surrounding noise measurement for 1 minute at 3 meter form the pit area at 30 cm form the ground
- STEP # 2 surrounding noise measurement for 1 minute at 20 meter form the pilot center at 1.50 meter form the ground
- STEP # 3 surrounding noise measurement for 1 minute at 30 meter form the pilot center at 1.50 meter form the ground
- STEP # 4 surrounding noise measurement for 1 minute at 40 meter form the pilot center at 1.50 meter form the ground
- STEP # 5 surrounding noise measurement for 1 minute at 50 meter form the pilot center at 1.50 meter form the ground
- STEP # 6 surrounding noise measurement for 1 minute at pilot center at 1.50 meter form the ground

3.2 TEST # 2 (STANDARD CONFIGURATION)

Standard F2C Model Configuration with ZALP Engine, 4.5 mm Venturi diameter and 6 x 6 ¾ inch carbon propeller and standard fuel

- STEP # 1 Noise measurement of the model on the ground for 1 minute at 3 m from the model side at 30 cm from the ground (as per ABR para 1.2)
- STEP # 2 Noise measurement of model in flight for 1 minute at 20 meter form the pilot center at 1.50 meter form the ground
- STEP # 3 Noise measurement of model in flight for 1 minute at 30 meter form the pilot center at 1.50 meter form the ground

- STEP # 4 Noise measurement of model in flight for 1 minute at 40 meter form the pilot center at 1.50 meter form the ground
- STEP # 5 Noise measurement of model in flight for 1 minute at 50 meter form the pilot center at 1.50 meter form the ground
- STEP # 6 Noise measurement of model in flight for 1 minute at pilot center on the scolder of the pilot

3.3 TEST # 3 (CONFIGURATION without Exhaust Deflector)

Standard F2C Model Configuration with ZALP Engine, 4.5 mm Venturi diameter and 6 x 6 ¾ inch carbon propeller and standard fuel

- STEP # 1 Noise measurement of the model on the ground for 1 minute at 3 m from the model side at 30 cm from the ground (as per ABR para 1.2)
- STEP # 2 Noise measurement of model in flight for 1 minute at 20 meter form the pilot center at 1.50 meter form the ground
- STEP # 3 Noise measurement of model in flight for 1 minute at 30 meter form the pilot center at 1.50 meter form the ground
- STEP # 4 Noise measurement of model in flight for 1 minute at 40 meter form the pilot center at 1.50 meter form the ground
- STEP # 5 Noise measurement of model in flight for 1 minute at 50 meter form the pilot center at 1.50 meter form the ground
- STEP # 6 Noise measurement of model in flight for 1 minute at pilot center on the scolder of the pilot

3.4 TEST # 4 (3 mm VENTURI CONFIGURATION)

Standard F2C Model Configuration with ZALP Engine, 3.0 mm Venturi diameter and 6 x 6 ¾ inch carbon propeller and standard fuel

- STEP # 1 Noise measurement of the model on the ground for 1 minute at 3 m from the model side at 30 cm from the ground (as per ABR para 1.2)
- STEP # 2 Noise measurement of model in flight for 1 minute at 20 meter form the pilot center at 1.50 meter form the ground
- STEP # 3 Noise measurement of model in flight for 1 minute at 30 meter form the pilot center at 1.50 meter form the ground
- STEP # 4 Noise measurement of model in flight for 1 minute at 40 meter form the pilot center at 1.50 meter form the ground
- STEP # 5 Noise measurement of model in flight for 1 minute at 50 meter form the pilot center at 1.50 meter form the ground
- STEP # 6 Noise measurement of model in flight for 1 minute at pilot center on the scolder of the pilot

3.5 TEST # 5 (3 mm VENTURI CONFIG w/o Exhaust Deflector)

Standard F2C Model Configuration with ZALP Engine, 3.0 mm Venturi diameter and 6 x 6 ¾ inch carbon propeller and standard fuel

- STEP # 1 Noise measurement of the model on the ground for 1 minute at 3 m from the model side at 30 cm from the ground (as per ABR para 1.2)
- STEP # 2 Noise measurement of model in flight for 1 minute at 20 meter form the pilot center at 1.50 meter form the ground
- STEP # 3 Noise measurement of model in flight for 1 minute at 30 meter form the pilot center at 1.50 meter form the ground
- STEP # 4 Noise measurement of model in flight for 1 minute at 40 meter form the pilot center at 1.50 meter form the ground
- STEP # 5 Noise measurement of model in flight for 1 minute at 50 meter form the pilot center at 1.50 meter form the ground
- STEP # 6 Noise measurement of model in flight for 1 minute at pilot center on the scolder of the pilot

3.6 TEST # 6 (STANDARD CONFIGURATION)

100 laps with SOLO PILOT with 2 Pit-stops in order to determine the average speed in the whole hit.

3.7 TEST # 7 (CONFIGURATION without Exhaust Deflector)

100 laps with SOLO PILOT with 2 Pit-stops in order to determine the average speed in the whole hit.

3.8 TEST # 8 (3 mm VENTURI CONFIGURATION)

100 laps with SOLO PILOT with 2 Pit-stops in order to determine the average speed in the whole hit.

3.9 TEST # 9 (3 mm VENTURI CONFIG w/o Exhaust Deflector)

100 laps with SOLO PILOT with 2 Pit-stops in order to determine the average speed in the whole hit.

4. TEST REPORT

The test has been performed at Lugo di Romagna F2C Air field, on Sunday 23 February 2014 by Mr. Lillo CONDELLO CIAM Italian Alternate Delegate and Mr. Claudio POCATERRA Italian Member of F2 CIAM Sub-Committee

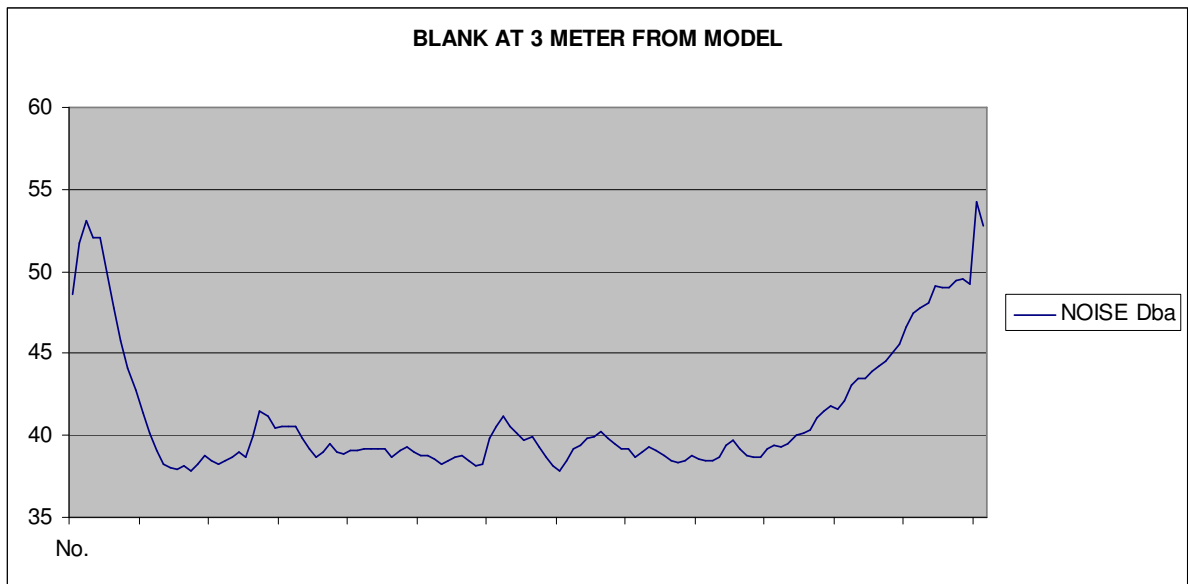
Here following are reported the tests result of each test cases presented in the previous paragraph.

It has been decided to skip test cases 3, 5, 7, 9 for the following reason:

1. Row Data analysis of test cases 2 and 4 has provided data already below FAI ABR Rules in terms of Noise Limit therefore it has been considered useless the test without Exhaust Deflector in both configurations. As a consequence also the 100 Laps time verification has been skipped as well.
2. It has been considered useless to introduce more configuration on the present discussion already complicated.

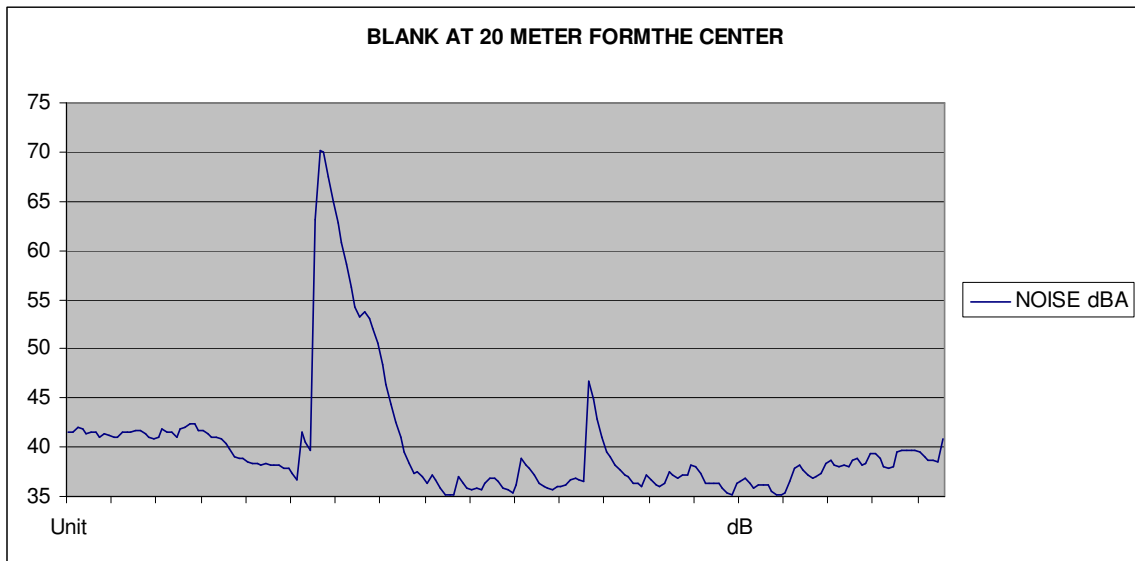
4.1 TEST CASE # 1 (BLANK NOISE MEASUREMENT)

- STEP # 1 surrounding noise measurement for 1 minute at 3 meter form the pit area at 30 cm form the ground



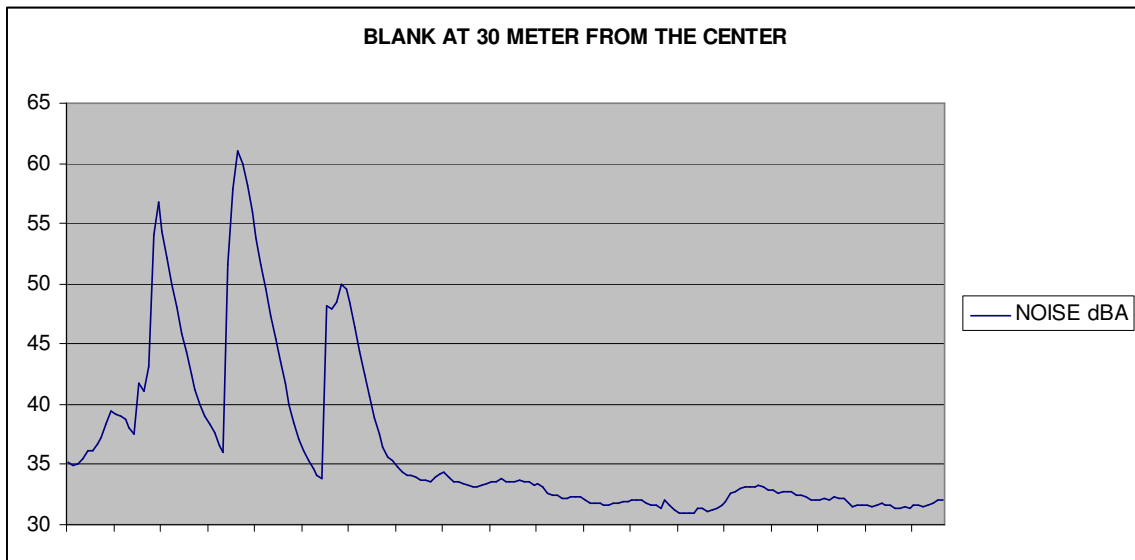


- STEP # 2 surrounding noise measurement for 1 minute at 20 meter form the pilot center at 1.50 meter form the ground



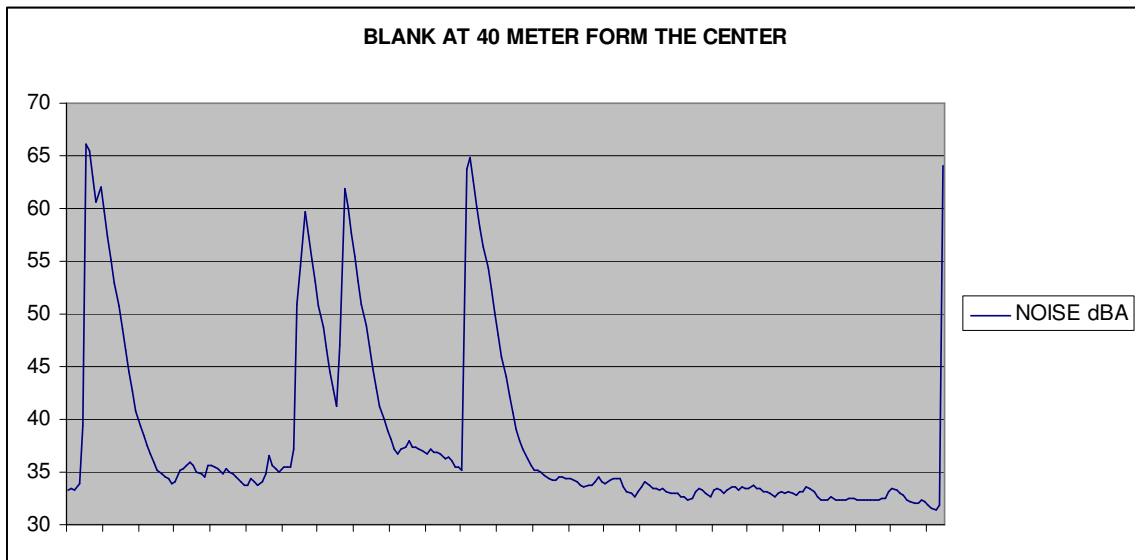


- STEP # 3 surrounding noise measurement for 1 minute at 30 meter form the pilot center at 1.50 meter form the ground



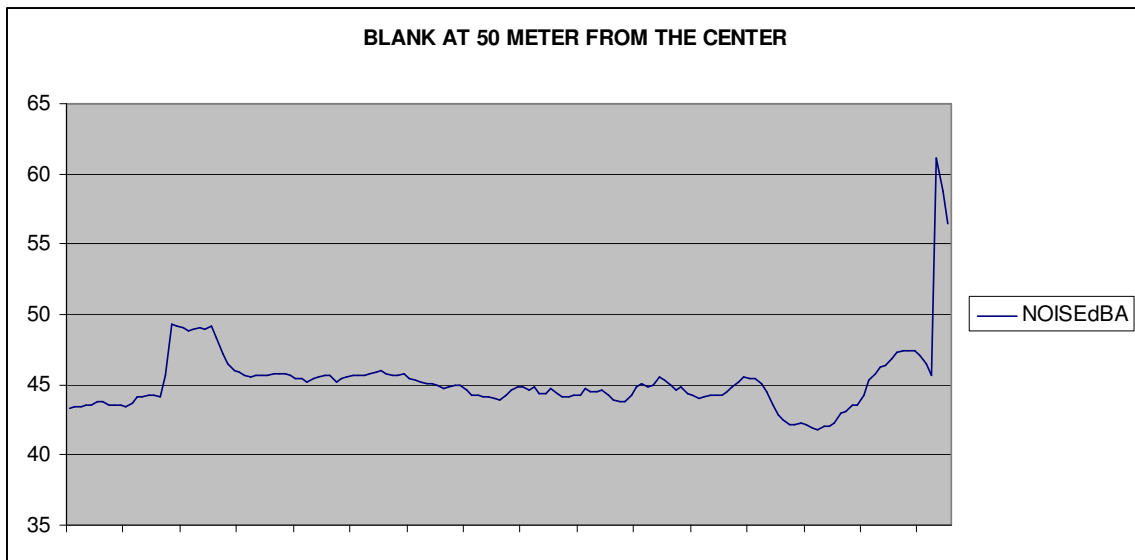


- STEP # 4 surrounding noise measurement for 1 minute at 40 meter form the pilot center at 1.50 meter form the ground



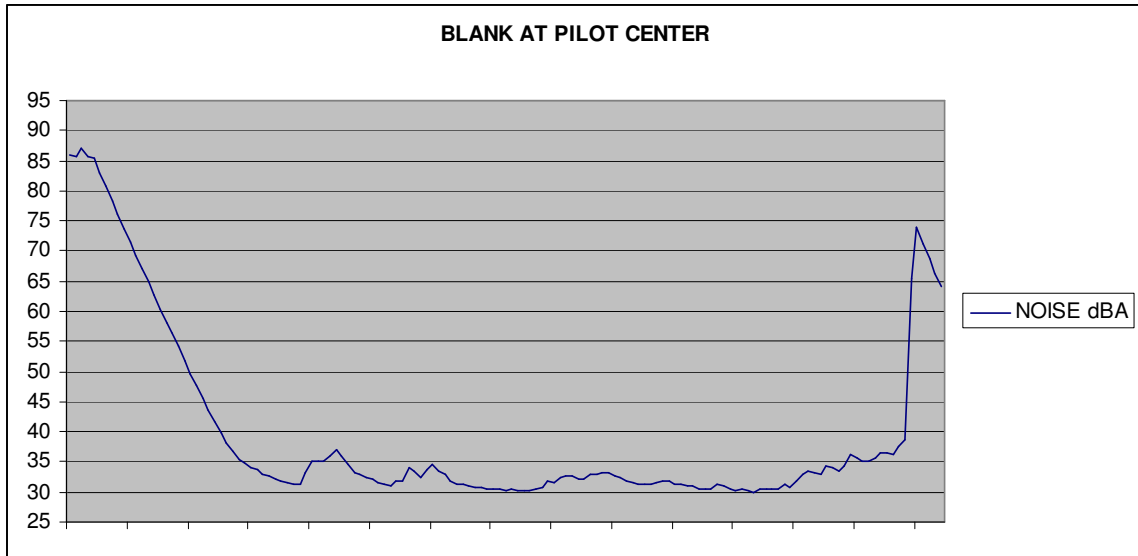


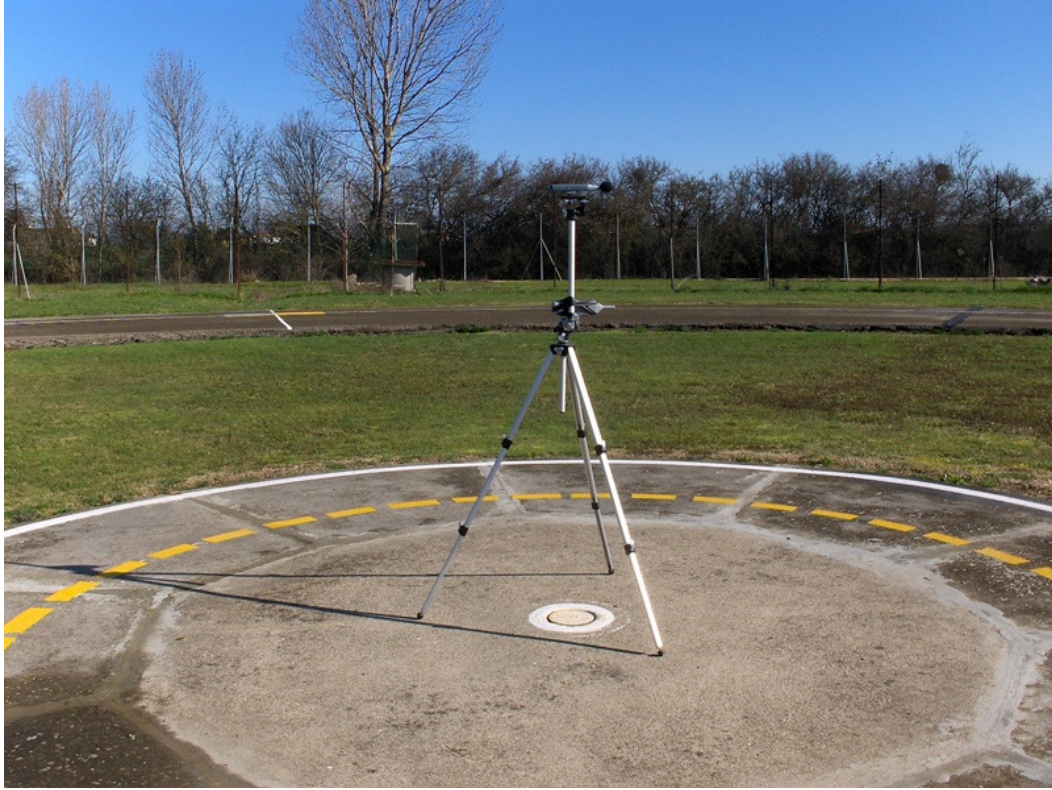
- STEP # 5 surrounding noise measurement for 1 minute at 50 meter form the pilot center at 1.50 meter form the ground





- STEP # 6 surrounding noise measurement for 1 minute at pilot center at 1.50 meter form the ground

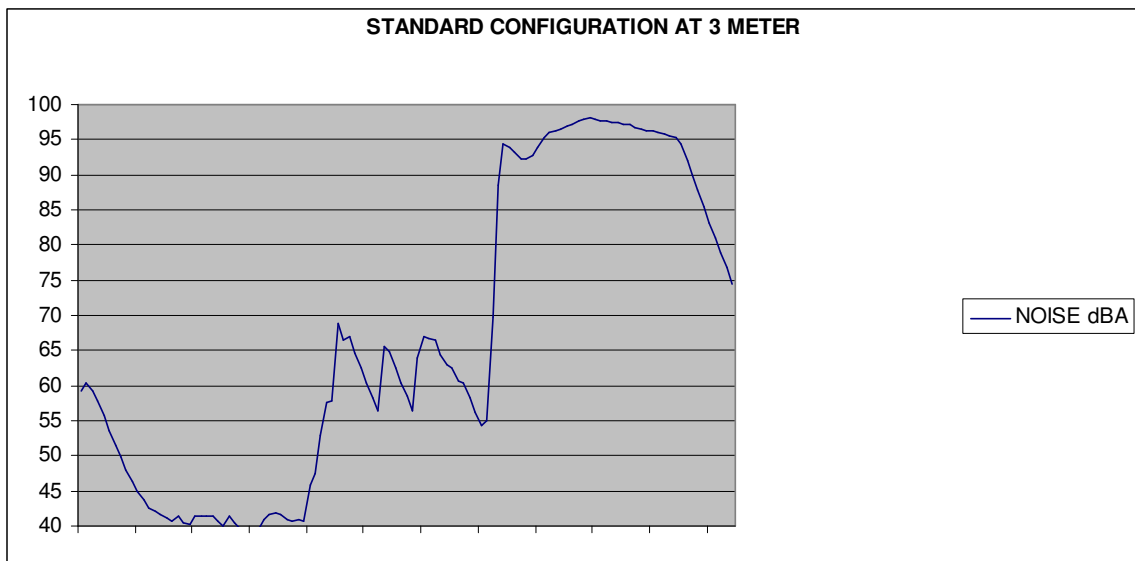




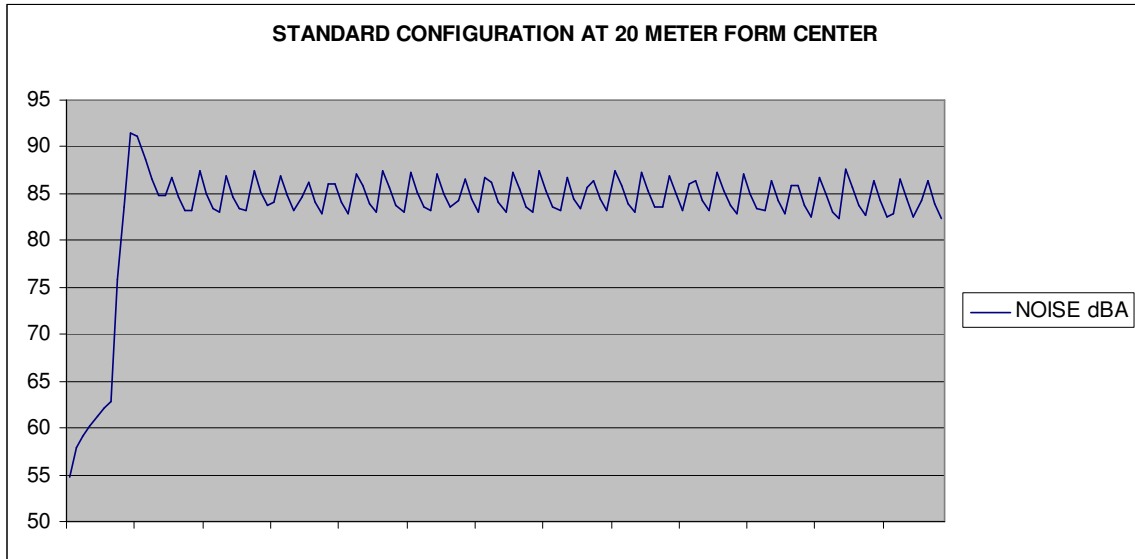
4.2 TEST CASE # 2 (STANDARD CONFIGURATION)

Standard F2C Model Configuration with ZALP Engine, 4.5 mm Venturi diameter and 6 x 6 ¾ inch carbon propeller and standard fuel

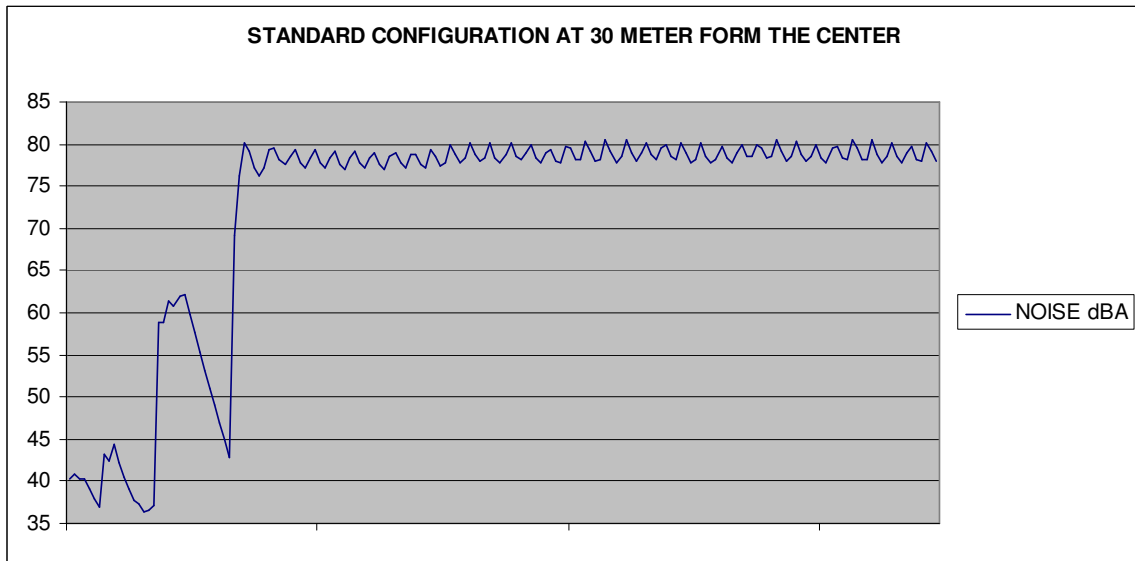
- STEP # 1 Noise measurement of the model on the ground for 1 minute at 3 m from the model side at 30 cm from the ground (as per ABR para 1.2)



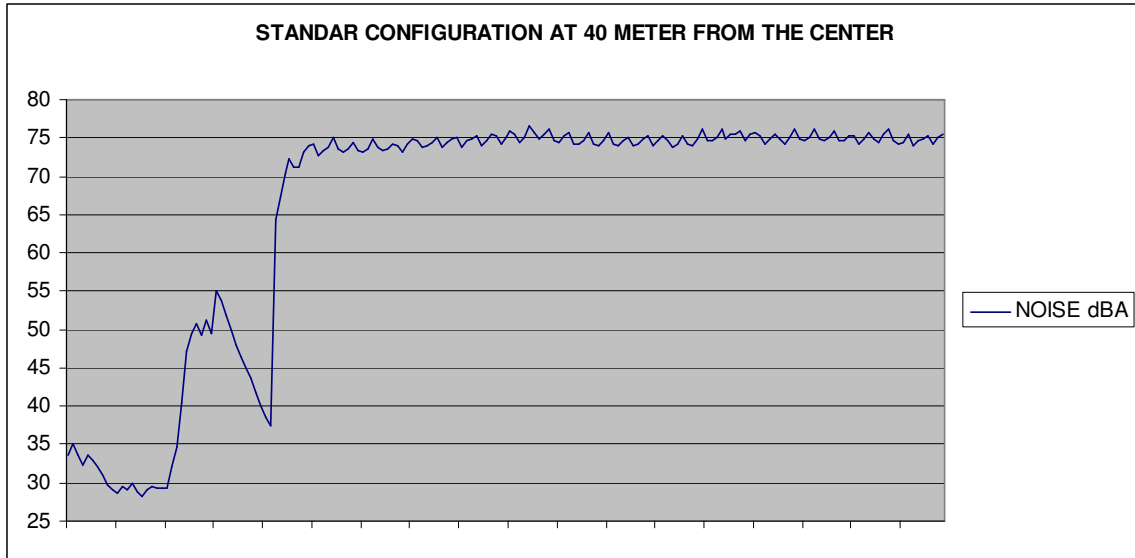
- **STEP # 2** Noise measurement of model in flight for 1 minute at 20 meter form the pilot center at 1.50 meter form the ground



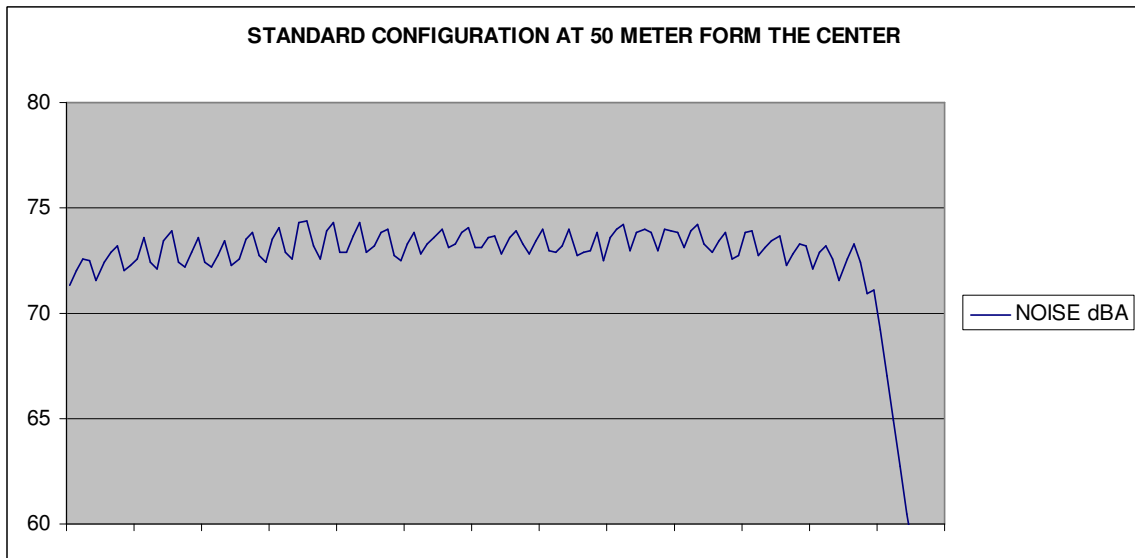
- **STEP # 3** Noise measurement of model in flight for 1 minute at 30 meter form the pilot center at 1.50 meter form the ground



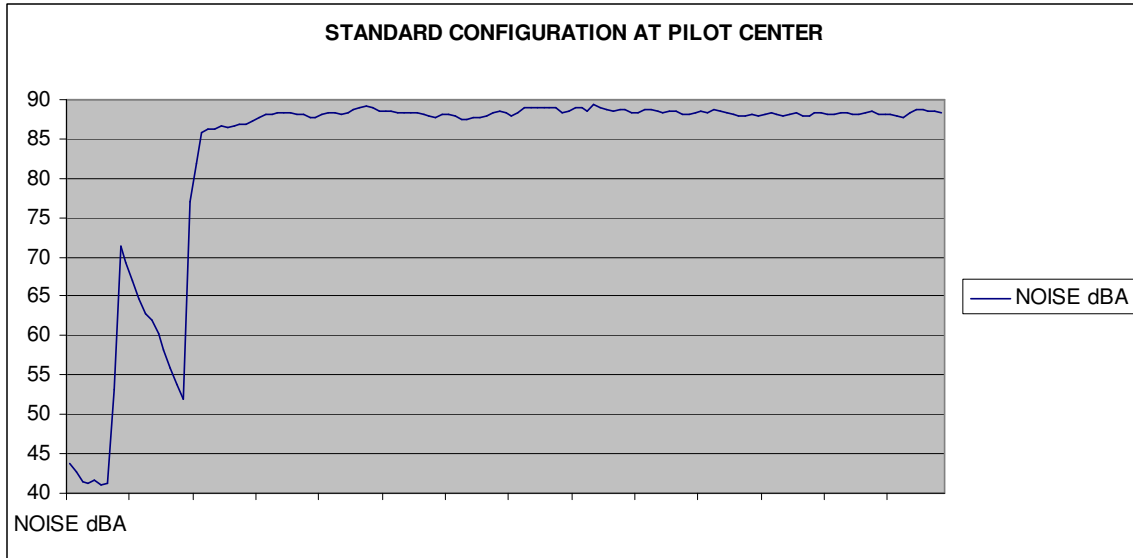
- **STEP # 4** Noise measurement of model in flight for 1 minute at 40 meter form the pilot center at 1.50 meter form the ground



- STEP # 5 Noise measurement of model in flight for 1 minute at 50 meter form the pilot center at 1.50 meter form the ground



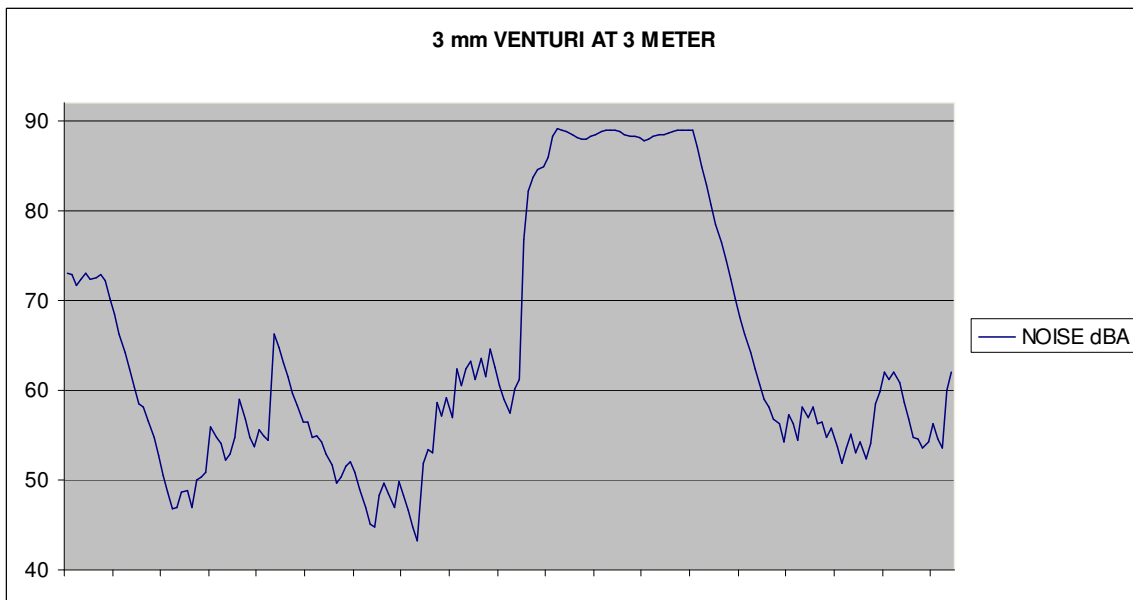
- STEP # 6 Noise measurement of model in flight for 1 minute at pilot center on the scolder of the pilot



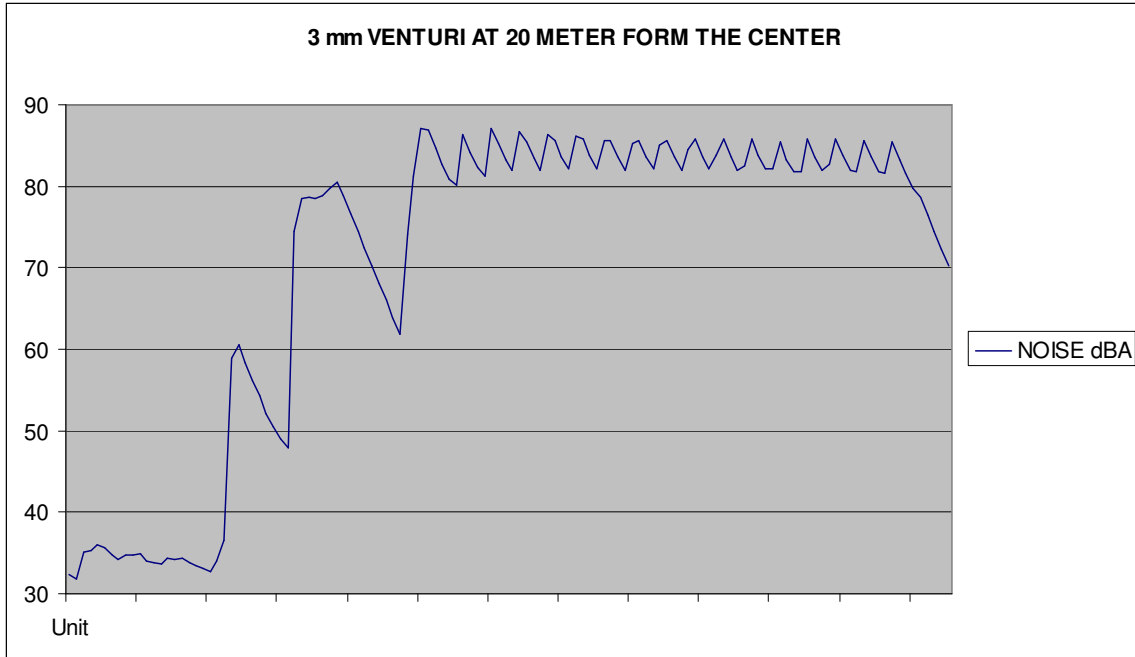
4.3 TEST CASE # 4 (3 mm VENTURI CONFIGURATION)

Standard F2C Model Configuration with ZALP Engine, 3.0 mm Venturi diameter and 6 x 6 ¾ inch carbon propeller and standard fuel

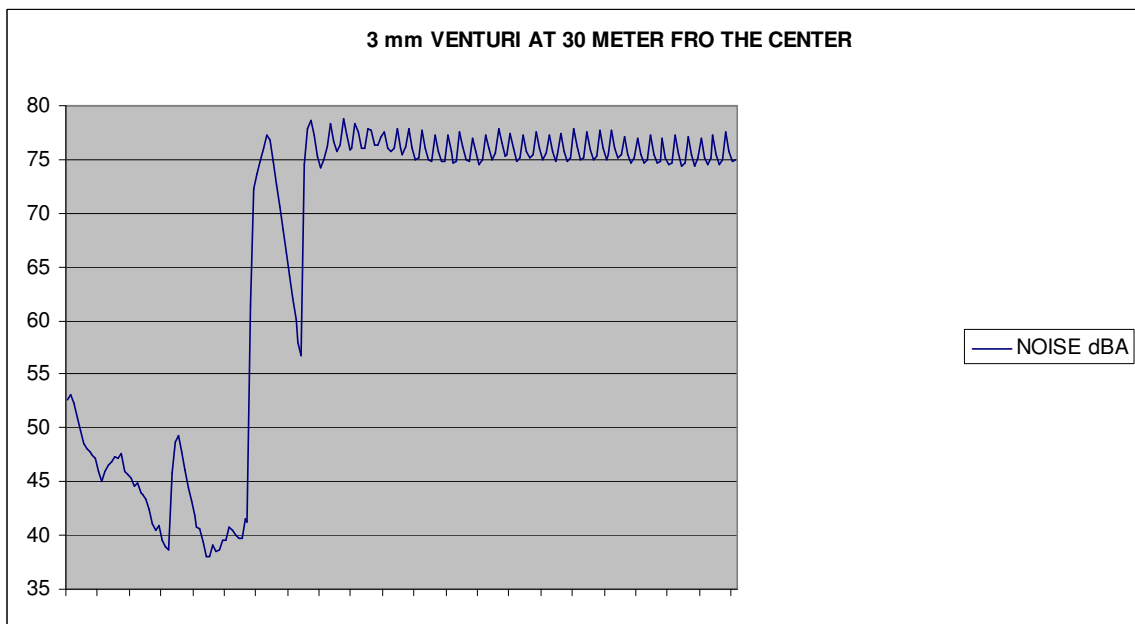
- STEP # 1 Noise measurement of the model on the ground for 1 minute at 3 m from the model side at 30 cm from the ground (as per ABR para 1.2)



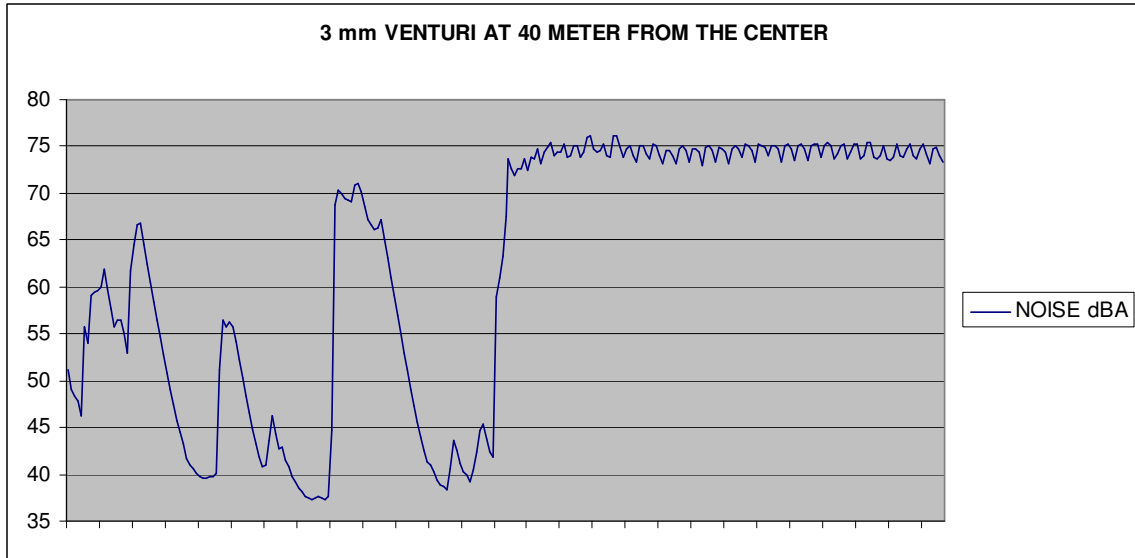
- STEP # 2 Noise measurement of model in flight for 1 minute at 20 meter form the pilot center at 1.50 meter form the ground



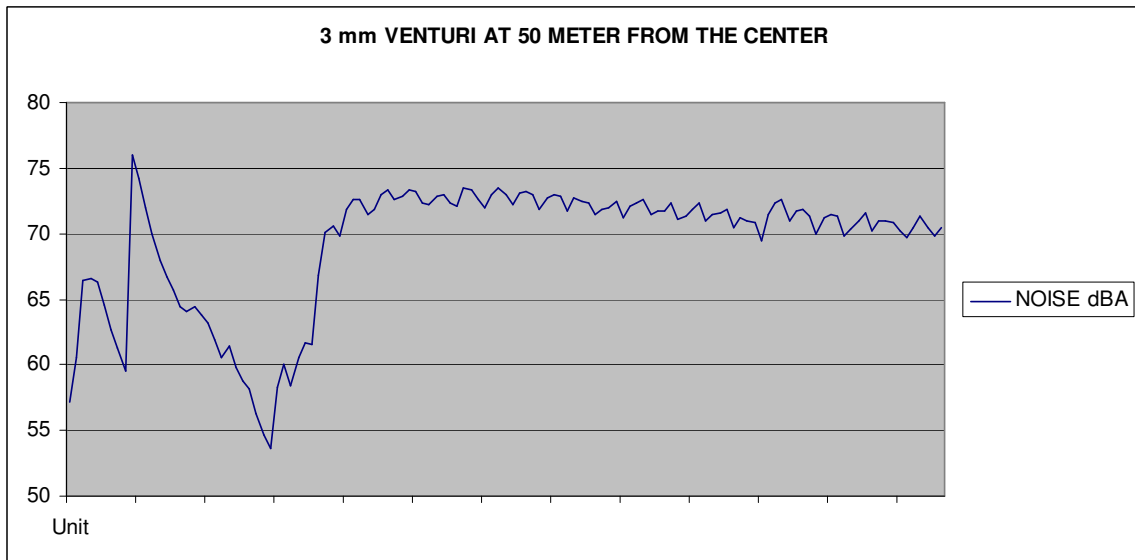
- STEP # 3 Noise measurement of model in flight for 1 minute at 30 meter form the pilot center at 1.50 meter form the ground



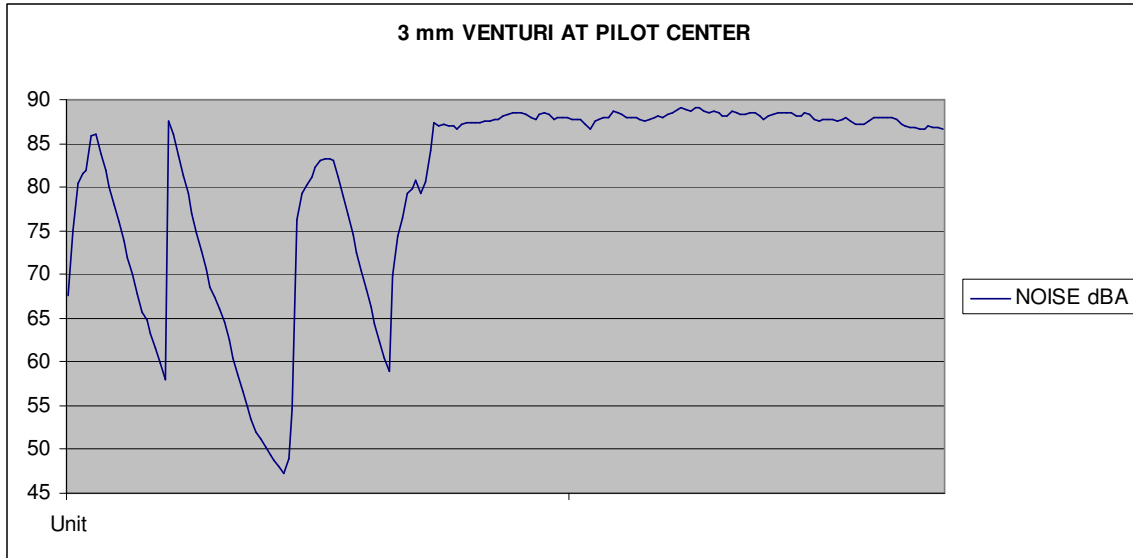
- STEP # 4 Noise measurement of model in flight for 1 minute at 40 meter form the pilot center at 1.50 meter form the ground



- STEP # 5 Noise measurement of model in flight for 1 minute at 50 meter form the pilot center at 1.50 meter form the ground



- STEP # 6 Noise measurement of model in flight for 1 minute at pilot center on the scolder of the pilot



4.4 TEST CASE # 6 (STANDARD CONFIGURATION)

Standard F2C Model Configuration with ZALP Engine, 4.5 mm Venturi diameter and 6 x 6 ¾ inch carbon propeller and standard fuel

100 laps with SOLO PILOT with 2 Pit-stops in order to determine the average speed in the whole hit.

Total Time is 3'.26'' with an average time of 18''.30/100 on 10 laps

4.5 TEST CASE # 8 (3 mm VENTURI CONFIGURATION)

Standard F2C Model Configuration with ZALP Engine, 3.0 mm Venturi diameter and 6 x 6 ¾ inch carbon propeller and standard fuel

100 laps with SOLO PILOT with 2 Pit-stops in order to determine the average speed in the whole hit.

Total Time is 3'.40'' with an average time of 19''.40/100 on 10 laps

5. CONCLUSION

After analysis of the data it is recommended to introduce for SAFETY Reason the Venturi Downsize to 3.0 mm in order to slow down the models speed making the categories more affordable for pilot and judges and providing more space for further development on engine, propeller etc.

As a second effect it has been demonstrated that with the 3.0 mm venture size noise level decrease of 6.9 dBA at 3 meter side w.r.t. the FAI requirement of 96 dBA as per ABR para 1.2.

ANNEX # 1

MULTIFUNCTIONAL SOUND LEVEL METER

This Sound level meter is small in size, light in weight, easy to carry. Although complex and advanced, it is convenient to use and operate. Its ruggedness will allow many years of use if proper operating techniques are followed. Please read the following instructions carefully and always keep this manual within easy reach.

Can only be shut down manually in such a case.


9. CALIBRATION

The standard method to calibrate the meter requires an external ND9 calibrator in addition to a small screw-driver.

9.1 Calibrate the meter by the ND9

- a. Turn the meter ON
- b. Put the meter in the 'A' weighting mode
- c. Put the meter in the 'SLOW' response mode
- d. Place the microphone into the calibrator. Turn the calibrator ON.
- e. Adjust the meter's CAL potentiometer so that the meter's display matches the output of the calibrator.

9.2 Calibrate the meter by the built in signal

To enter the calibration state, just switch on the meter, depress the  key till the icon "CAL" is on the display. Then use a screw-driver to adjust the meter's CAL potentiometer so that the meter displays 94dB.

10. CONSIDERATIONS

- 10.1 Wind blowing across the microphone increases the noise measurement. Use the supplied windscreen to cover the microphone when applicable.
- 10.2 Do not attempt to dismantle the meter yourself. There are no user-serviceable parts

1. FEATURES

- Compatible with standards of IEC 651 Type 2, ANSI 1.4 Type 2.
- Widely used to test the sound level of environment, machinery, vehicle, ship and other noise.
- Multifunctional. It offers 4 measurement parameters: L_p (sound level), L_{eq} (Equivalent Continuous A Sound Level), L_{max} (Maximum Sound Level) and L_N (Percent of all readings over alarm value set).
- With alarm set and alarm output.
- This meter permits choice of 'A', 'C', or 'Flat' weighting and 'Slow' / 'Fast' response times.
- DC output: 0~1.3V/10mV/dB.
- Auto range selection and digital display with no guessing errors.
- Manual or automatic shut down. The tester can be switched off by pressing the power key at any time. On the other hand, The tester can be set to auto power off between 1 to 9 minutes or disable auto power off.
- The tester can memorize 30 groups of measurement results and measuring conditions for later use or download to PC.
- Can communicate with PC computer for statistics, printing and analysing by the optional cable and the software for RS232C interface.

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2.SPECIFICATIONS

Display:14mm (0.55 ") LCD with backlight
 Parameters measured: Lp, Lmax, Leq , Ln.
 Measurement range:
 Lp: 30~130dB (A)
 35~130dB (C)
 35~130 dB (F)
 Leq: 30-130dB (10s, 1min, 5min,
 10min, 15min, 30min, 1hour,
 8hour, 24hour)
 Ln : 0-100%
 Resolution: 0.1 dB
 Accuracy: ± 1dB
 Frequency weighting: 'A', 'C', 'F' (Flat)
 Time weighting :Fast (125ms)
 Slow (1 second)
 Microphone:1/2 inch electret condenser type
 Memory: 30 groups with measuring
 conditions
 Built in calibration signal: 94dB at 1kHz
 (sinusoidal)
 Frequency range: 20 to 12,500 Hz
 Alarm value set: 30-130 dB
 Alarm output: LED and optional relay
 contact (NC)
 PC interface: RS232C
 Low battery indication
 Power supply: 4x1.5v AAA (UM-4
 battery)






inside.

11.BATTERY REPLACEMENT




- 11.1 When battery voltage less than approx. 5v, it is necessary to replace the batteries.
 11.2 Install a the batteries 4x1.5v AAA (UM-4) correctly into the case.
 11.3 If the instrument is not to be used for any extended period, remove batteries.
 Note: If AC adapter is used, batteries should be taken away.

the period of measurement time, just press  for about 8 seconds till "Leq" is on the display, release the key, then select the set time among 10s, 1min, 5min, 10min, 15min, 30min, 1hour, 8hour, 24hour by depressing Up or Down key. To quit, just depress any key except  or  key.

7.HOW TO SET THE ALARM VALUE?

The alarm LED is on when the instant measurement value is larger than or equal to the alarm value set. The default setting value at the factory is 85dB. Users can change it to any value between 30-130dB by following steps. Depress  for about 5 seconds, release it after "AL" shows on display, then press  key or  key to preset the alarm value as desired. To quit, just depress any key except  or  key.

8.HOW TO SET THE TIME OF AUTO POWER OFF

The default setting for auto power off at the factory is 5 minutes. That means the meter will auto power off 5 minutes from the time of last key operation. Users can change it to any value between 1-9 minutes by following steps. Depress  for about 10 seconds, release it after "AU T O" shows on display, then press  or  key to preset the time as desired. To disable the function of auto power off, just preset the time to 0. It will

5. STORING AND RECALLING READINGS

- 5.1 When in 'M' state, you can save the reading together with measuring conditions to the memory of the meter by pressing the key. Then the icon 'M' changes to 'M' automatically while the number of memorized readings increases 1.
- 5.2 No matter in 'M' state or 'M' state, the memorized data can be browsed by depressing the key. The browsing state is marked in 'R' on display. When in 'R' state, all the readings memorized can be recalled by depressing the key or key.
- 5.3 To delete the memorized value in memory, just enter the browsing state and locate the reading to be deleted by the key or key, then depress the key. If there is an "Err0" on the display, it indicates there is no reading to delete any more.

6. HOW TO SET THE LEQ TIME?

Leq is used to assess the rms average noise level over a preset period of time, often the starting point of a noise assessment. To take a Leq measurement, the period of time over which it is to be made must be selected. The longer the period of measurement time, the more accurate the Leq reading will be. To set

External DC power supply: 6 V DC, 100mA

Size: 236x63x26 mm / 9.3x2.5x1.0inch

Weight: 170g (including batteries)

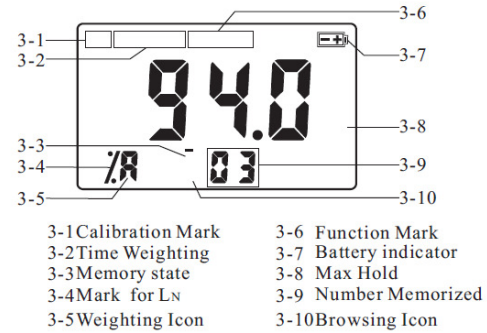
Standard delivery:

1. Main Unit ······ 1pc ······
2. Carrying Case ······ 1pc ······
3. Operation Manual ······ 1pc ······
4. Windscreen ······ 1pc ······

Optional Accessories:

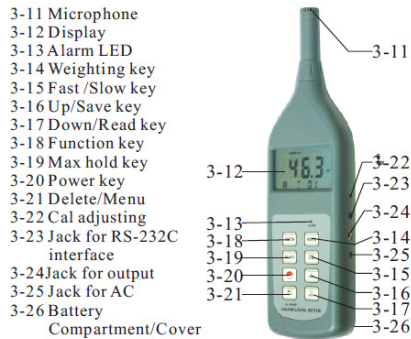
1. ND9 sound level meter calibrator
2. Cable and software for RS232C
3. External relay
4. AC adapter

3. FRONT PANEL DESCRIPTIONS



6

3



4. MEASURING PROCEDURE

- 4.1 Press the key (Fig.1, 3-20) and release to switch on the power.
- 4.2 Check whether the function selected is right. If not, change it by depressing the key. The default setting is Lp, weighting A, Fast.
- Lp - current sound pressure level
Leq- Equivalent Continuous A Sound pressure Level, i.e. Arithmetically mean value in a period of time set.
- Ln- Statistic analysis, i.e. What percent of all measurement values are larger than or equal to the alarm value set by the user. For setting the alarm value, please see page 7.

4

- 4.3 Check whether the weighting is right. If not, change it by depressing the key to select 'A', 'C' or 'Flat'.

With 'A' weighting selected, the frequency response of the meter is similar to the response of the human ear. 'A' weighting is commonly used for environmental or hearing conservation programs such as OSHA regulatory testing and noise Ordinance law. 'C' weighting is a much flatter response and is suitable for the sound level analysis of machines, engines, etc.

NOTE: Weighting 'A' will be automatically selected when measuring Leq.

- 4.4 Use the key to select a Fast (125 ms) or a Slow (1 second) response time. Select Fast to capture noise peaks and noises that occur very quickly. Select the Slow response to monitor a sound source that has a consistent noise level or to average quickly changing levels. Select Slow response for most applications.
- 4.5 The reading is the peak one if the icon 'max' appears on the Display. The reading is an instant value if 'max' does not show up. The appearance of symbol 'max' is controlled by depressing the key in the process of measurement.

5