



# BoP for Performance Parity & Control

Version 47

This document is Essential Reading for all Competitors who may have BoP imposed, and for all Competitors who intend to fill out the form titled: “APS - BOP Nomination FORM V\*”.

Document Amendment Table		
Description, location	Date varied	Web Publish
Previous versions of this file are located within the adjacent Obsolete folder		
Earlier Updates are listed in earlier versions of this file		
Upgraded <a href="#">BoP Creation According to Simulation and Predicted Performance</a> , added <a href="#">Initial BoP based on Simulations: the process</a>	26/3/2023	
Upgraded <a href="#">BoP Creation According to Simulation and Predicted Performance</a> , added <a href="#">Initial BoP based on Comparisons: the Process</a>	29/3/2023	
Varied Forced Induction <a href="#">Control Point</a> : added preferred Boost control device, upgraded <a href="#">Control Point: Throttle Position (TP)</a> :	22/7/2023	23/7/2023
Upgraded <a href="#">Forms of Control of BoP</a> :, <a href="#">Control, Methods and Measurement</a> ; <a href="#">BOP application Range</a> ; <a href="#">Effecting Controls</a> ; <a href="#">Specification of Minimum Race Weight</a> :	23/9/2023	28/9/2023
<a href="#">Effecting Controls</a>	19/10/2023	
Variations to the BoP System: Upgraded description within <a href="#">Performance Control and Control Methods</a> , <a href="#">Forms of Control of BoP</a> ; <a href="#">BOP application Range</a> ; <a href="#">Effecting Controls</a> ; <a href="#">Specification of Inlet Air Restriction</a> ; <a href="#">Engine forced air induction</a> ; <a href="#">Boost Pressure</a> ; <a href="#">Engine Air Induction inlet Restriction</a> ; <a href="#">Throttle Body</a> ; <a href="#">Application of Finishing Race Weight (FRW) as BoP</a> ; <a href="#">Specification of maximum engine RPM</a> ; <a href="#">Review of BoP</a>	30/3/2024	
Upgraded <a href="#">Effecting Controls</a> , to better introduce FRW	1/4/2024	
Further small changes: <a href="#">Forms of Control of BoP</a> . Clearly identified Nominated Forms of BoP, and Moved to FRW section to be placed separate to the Nominated Forms of BoP	4/4/2024	
Upgraded <a href="#">Turbocharged engines</a> to allow only the nomination of Weight with BPR	5/4/2024	
Upgraded <a href="#">BoP Control Methods and Devices</a> , <a href="#">Measurement Devices</a> , and <a href="#">Verification of Compliance</a> , added Rules <a href="#">Refer also to the separate essential Information documents</a>	3/5/2024	31/5/2024
Clarified <a href="#">Application of Finishing Race Weight (FRW)</a> . Upgraded name of BoP Sheet <a href="#">APS - BoP Sheet - Issue V*</a>	31/5/2024	3/6/2024
<a href="#">Natsoft competitive session Results</a>	10/6/2024	Sep 2024
Removed Application of Finishing Race Weight (FRW) as a System. <a href="#">Increment of change</a> : of Weight as BoP are now 10 kg. Upgraded <a href="#">Measurement: Boost Pressure</a> Absolute Pressure is measured and specified, with Nil Tolerance	10/3/2025	yes

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**Refer also to the separate essential Information documents:**

APS - BoP - an Introduction V\*

APS - BoP Nomination FORM V\*

APS – BoP Rules V\*

APS - BoP Sheet - Issue V\*

APS Australian Prototype Series Sporting Regulations

Utilise as necessary:

APS – BOP Calculator

APS – BOP Technical Check of BOP Parameters FORM

APS – BOP Competitor Request for BOP Variation FORM

APS – BOP Competitor Request for BOP Review FORM

# An Introduction

When participating in Motorsport Australia Championship Events, the Australian Prototype Series (APS) is the Category Manager (CM) of the Series (the Series). The APS may also provide other such competition Events where the application of BoP may or may not be required, or may be varied.

The Australian Prototype Series (APS) is also an individual entity that provides participation in racing Events that may not be part of the Motorsport Australia Championships, where the application of BoP may not be required, or the Rules and Application may be varied.

The APS provides racing for Prototype vehicles and seeks to accommodate all vehicles perceived to be racing Prototypes, irrespective of automobile classification or type. A current vehicle Log Book as issued by Motorsport Australia is a requirement, and vehicles may be of a range of makes, models, specification, and may have never before raced, or may have previously raced or be currently racing in another class or category.

Individual vehicles may be (and are even encouraged to be) continuously modified to improve performance both before and during its participation in the Series, and may include variations in setup and components, such as changes to improve aero downforce, weight, engines, chassis, suspension, and brakes. The performance improvements as achieved may, depending on racing outcomes, result in the employment of methods to achieve Sporting Parity.

## Performance Parity

Many people fail to recognise that virtually all vehicles in all categories of competition are handicapped relative to each other so that “close” racing can occur. Mostly, this is achieved by having single make/model categories, where differentiation between vehicles is limited by rules and specification.

Vehicles that may race in the Series comprise a wide variety of vehicles that may be classified as “prototypes”. These vehicles will vary from purpose-built one-off pure race Prototypes to limited-production race vehicles that are inevitably individualized by both manufacturer and competitor.

### Technical vs Sporting Parity

Technical Parity is commonly seen in single-make categories, where technical regulations seek to create similar if not identical performance characteristics between vehicles of the same make and model so as to ensure performance parity – such equivalent performance is sought so as to create close racing. Other categories such as F1 and Supercars may have varying manufacturers, but technical requirements are specified so as to achieve similar if not the same performance characteristics. This creates uninteresting processions of vehicles where they have great difficulty overtaking each other.

Sporting Parity is rare, and more suitable to categories with varying car types, makes and models. The individual performance characteristics of Prototype vehicles will vary widely, and each will explore the boundaries of that which is practically achievable with modern technology, innovation, and vehicle development.

Inevitably, some Prototypes will be faster than others. In the interests of creating similar lap times rather than identical performance, Balance of Performance controls are utilised to achieve Sporting Parity, thereby creating overtaking opportunities and interesting racing,.

## What is Balance of Performance?

Balance of Performance (BoP) is the “balancing” (increasing or reducing the lap times) of the performance of individual vehicles relative to other vehicles.

BoP is effected by requiring a simple change to either the Power or Weight of the vehicle, or both.

Due to the wide diversity of Types of vehicles that are encouraged to race within the Series, BoP is necessarily based on known vehicle performance potential, combined with actual competition

outcomes, consequent to the racing performance of the individual vehicle and the performance of the individual driver.

### **Why?**

- BoP is applied to progress and promote the interest of the Series and its Participants, by creating diverse and close racing with a high degree of overtaking for the enjoyment of
  - Participants
  - Race commentators
  - Media
  - Viewing audience
  - Sponsors

### **Intention:**

- Encourage a wide diversity of vehicle types to promote competitor participation and spectator interest.
- Create competitive racing of vehicles.
- Seek similar lap times that are constructed in different manners based on encouraging vehicle diversity.
- Promote differentiation in speed, cornering, acceleration, and braking characteristics that both encourage and enable overtaking, yet culminate in similar lap times.
- Allow Competitors to maintain and continuously develop their vehicles for best performance and reliability at lowest cost.

### **Marketing**

- BoP is marketed as part of the Series and allows the nomination and acceptance of a wide variety of cars where participants can achieve performance outcomes similar to other competitors.
- BoP as applied is not intended to obscure excellence, but rather to represent high Achievement.
- The Series intend that the Form and Degree of BOP as imposed should be recognised as being earned by the Competitor based on the excellence of outcomes as achieved.
- BoP will be published on the APS web site, promoted by Stickers as provided to competitors for application to vehicles, and communicated to Race Commentators and Media so that they can make suitably informed comment during racing and on race results.

### **Management Considerations:**

Prototypes are purpose-built racing vehicles with minimum regulation of components and specification, allowing maximum adjustability and continuous development of the base vehicle. APS seek to encourage continuous development of the capability of drivers, and APS seek to encourage continuous development of vehicles and their components and specification at low cost without unnecessary compromise to the core values of participation in the Series; according to the APS – Series Vision.

**Personal Performance:** According to the BoP Rules as described in the Sporting Regulations, BoP will necessarily be applied consequent to vehicle and driver achievement. Therefore, high performing drivers can expect to have BoP applied that is appropriate to the outcomes of their own capability.

**Inexperienced Participants** shall be encouraged by both a lack of BoP applied to them, and the provision of Class Awards.

## **Performance Control and Control Methods:**

For the various classes and types of prototype vehicles available, the Series invites competitors to submit details of their vehicle so that APS may assess what performance parity measures may be required if any, and provide advice such that a high degree of entertaining, close and competitive racing may be created with minimal controls applied.

The Series runs 3 Classes. Class 1 is not Prescriptive as to vehicle specification regarding vehicle eligibility. With Classes 2 and 3, where Specification is identified in separate Sporting Regulation by vehicle type, and nominated by APS in APS Sporting Regs, then such specification is to apply.

Performance parity, where deemed required by the Category Manager (CM) of the Series, is to be achieved by applying Balance of Performance (BoP) controls to individual vehicle/driver combinations.

Initially, high-performance vehicles may have the appropriate BOP applied based on known performance capabilities, and better-performing drivers may have BoP imposed on their vehicles during the racing season based on results.

**BoP is nominated by the Competitor.**

**BoP is controlled by the Category Manager (CM) of the Series, where the degree of BoP as applied will be based on competition Outcomes and the Rules**

**BoP is regulated by MOTORSPORT AUSTRALIA (MA).**

## **Forms of Control of BoP:**

The forms of control of BoP have been carefully chosen to be simple in application, easy to measure, easy for the competitor to manage during the intervals between competitive sessions, easy to remove, and be cost-effective for the competitor.

The forms of control of BoP that can be Nominated by the Competitor are:

- 1) Engine forced air induction Restriction: Boost Pressure Restriction (BPR)
- 2) Throttle Opening Restriction (TPR)
- 3) Minimum Race Weight using ballast (MRW)
- 4) Maximum Engine RPM (MER)

The Competitor will nominate their preferred forms of BoP using the BoP Nomination Form.

For all forms of BoP, safety is a priority. Should a concern exist (for example: maximum weight where ballast is carried), the competitor may be asked to provide manufacturer or engineering compliance advice to the Category Manager.

## **Control, Methods and Measurement**

BoP will be achieved by competitors applying performance-limiting controls to their vehicles. All nominations of forms of control must be approved by the CM.

### **Application Method and Control Devices**

For each Form of BoP as nominated by the competitor, the competitor may be asked to nominate the application method (for example: Induction air Boost restriction), and to provide the control device to be utilised (for example: a Boost Control device), and to provide an appropriate measuring device that can demonstrate compliance (for example: a nominated Boost Monitor device).

## BOP application Range

For each form of BoP as nominated by the competitor, where relevant, the competitor shall be required to nominate the starting points of application; and a finishing point if desired. These nominated points will also define the range over which the BoP shall apply.

For Safety reasons, where vehicle weight is nominated as a form of BoP, the competitor must nominate the highest level of weight at which the vehicle may safely compete. The Competitor may elect to, at any time, apply to vary such levels.

When completing the BoP Nomination form, all Competitors must provide a realistic starting point for BoP implementation, so that any increment of BoP as imposed will have an immediate effect on vehicle performance. Such Nominations will be checked.

eg: refer to [Specification of Minimum Race Weight](#) and [Engine forced air induction: Boost Pressure](#)

## Increments of BoP

Each Increment of BoP will result in performance outcomes with the aim of modifying relative lap times. For example, the CM will require staged amounts of increments, such as 0.1 BAR of Boost or 10kg of weight. An increment would be expected to result in a variation of racing lap time.

Where appropriate, the CM will develop and direct the competitor to apply increments of variation. Based on the APS Sporting Regulations and the APS BoP Rules, where increments of BoP are required to be applied, competitors may choose which Form of their nominated BoP to which the increment will be applied. Thus, if two forms of BoP are nominated, the competitor can choose to apply individual increments to either or both. And, if three forms of BoP are nominated, the competitor can choose to apply individual increments to one, two, or all three!

For each Form of BoP, within the Ranges as nominated, to either decrease or increase relative performance, BoP is to be progressively varied in the Increments nominated within the subsections within [Specification for the Forms of BoP](#).

## BoP Control Methods and Devices, Measurement Devices, and Verification of Compliance

BoP methods and controls must be created and provided by Competitors, must be able to be measured and monitored for compliance by the Category Manager (CM) and MA, and compliance must be able to be Verified by inspection by Event and APS Officials. Where appropriate, the CM may specify measurement devices and methods.

1. **Control Methods and Devices:** For each of the Forms of Control as nominated by the competitor and as approved by the CM, the competitor shall provide and install the performance Control Device to be utilised, such as a Boost Limiter or an engine Rev Limiter or additional Ballast, and ensure that it is capable and operating effectively.
2. **Measurement Devices:** The competitor shall also provide and install suitable and capable Measurement Devices that will be utilised to measure the relative levels of performance as controlled by the Control Devices.  
Competitors must ensure that Officials are able to access such devices so as to be able to measure the degree of application of the Control Device using the Measurement Device (such as the specified Boost Monitor or ECU data); or the competitor must ensure that a suitable measurement device is available (such as Scales to measure weight).
3. **Verification of Compliance:** The competitor is required to ensure that compliance may be Verified by an Official based on inspection of the device and/or data as provided by the competitor's Measurement Device. The competitor must be able to utilise the device to measure and thereby ensure compliance. If the Competitor cannot utilise the Measurement Device to verify to the satisfaction of the relevant Officials that the vehicle has complied, then non-compliance exists and Penalties will be applied.

Due to a possible lack of precision with measurement devices and methods, a degree of tolerance is permitted.

## Effecting Controls

- Before the start of competition for a racing season, and if appropriate during a racing season; the CM may, based on known or predicted performance capabilities, impose or vary BoP.
- Individual BoP is controlled according to the Rules, and each individual competitor / vehicle racing in the Series will be defined and listed in controlling documentation.
- BOP will be published prior to the start of race meetings as a BoP Sheet, and is regulated by MA. Such BoP will be required to be implemented prior to the first competitive session at the next Race Meeting.
- Based on the results of competitive sessions such as qualifying and races during a race meeting, the CM may also direct that BoP be varied during a Race Meeting between sessions, for application before the start of the next session.
- During the racing season, and according to the Rules and as described in the Sporting Regulations, BoP will be refined for and applied to individual vehicles and driver combinations by requiring the competitor to vary the vehicle specification to align with BoP requirements.
  - Based on Relative Performance and Finishing Position of each Competitor during each competitive Session, BoP will be varied by the application or reduction of increments of BoP in accordance with the BoP Rules.
  - The application of all BoP is based on the parameters as provided by the Competitor in the "APS - BOP Nomination FORM".
  - When BoP is initially applied as the first increment, it shall be added to Lowest Level of Restriction as nominated in the Form, and further increments as earned are cumulatively added, or removed.
  - The Competitor, when informed that BoP is required to be varied, will nominate the Form of BoP to which this variation shall apply.
  - Note that the increments of BoP as earned are to be added to the total of that which has been initially applied and accumulated up to that point.
- BoP as volunteered and increments as imposed will be measured, and cars will be checked for compliance, and verified as compliant or not.
  - BoP is normally checked for compliance at the end of competitive sessions whilst the car is in parc ferme.
  - BoP compliance may also be checked as and where appropriate at any time during an Event.
  - Non-compliance during a competitive session may result in the application of penalties as described in the Sporting Regulations.
- For each individual driver/vehicle combination, the BoP shall be progressively developed and applied as a consequence of competitive session outcomes during the sessions and events as held during the Calendar Season of racing events for the Series, and shall also be carried forward to the next Calendar Season unless Reviewed and varied.
- Where an individual driver/vehicle combination is varied, the previous BoP shall be re-examined as to continued application, or varied as appropriate to circumstances by the CM.
- The weight and speed of race cars is directly linked to Safety. All motorsport authorities are required to manage safety, including APS as a Category Manager.
  - APS will now seek to establish the weight all competitor's race vehicles at APS Events, irrespective of BoP Nominations, so as to become aware of the degree of risk as posed and the likely safety controls that may need to be effected in future.



# **BoP: Controlled according to Rules, and Calculated according to a Formula**

The balance of performance Control measures will be a transparent and defined process based on driver/vehicle performance.

The following information is typically required so as to effect appropriate control of BoP:

## **Natsoft competitive session Results**

The session results as published by Natsoft shall be utilised for the determination of BoP. For the rapid determination of BoP, the results of the most recent Competitive Session as published by Natsoft immediately after the conclusion of that session as Issue #1 Provisional Results will be utilised to determine the application and degree of BoP.

## **BoP Rules**

BoP Rules set the basis by which BoP decisions are made consequent to those factors that affect performance outcomes during racing and under various circumstances, such as incidents, accidents, and wet weather. These are described in the APS Sporting Regulations and in the “APS – BoP Rules V\*” documents which are available to all competitors.

## **BoP Formula**

BoP outcomes as increments of BoP to be applied, and to be removed, consequent to competition are determined according to formula within a spreadsheet and BoP Rules. After each competitive session, the session Fastest Lap Times and Finishing Order Positions are taken from Natsoft and entered in to the spreadsheet for each competitor, and embedded formulae calculate a “Median Lap Time (MLT)”, and competitors lap times are compared to this basetime. The spreadsheet then calculates whether BoP needs to be varied, and indicates by how much.

Based on the results of these calculations, a variation of BoP is then advised to the Competitor. The competitor decides where it is to be applied, and must apply it before the next competitive track session. The required BoP is then published.

The APS - BOP Calculator will be made available by the CM to competitors on request.

## **BoP Creation According to Simulation and Predicted Performance.**

It may be perceived that a new Competitor and/or a new vehicle will have performance capabilities of a level that would disrupt the intention of Sporting Parity, and where the outcomes would be disconcerting to other competitors. Prior to such participation in the Series, where the CM determines that an initial level of BoP is required to be applied to individual vehicles, the CM may, based on known or predicted performance capabilities, impose a certain level of BoP.

For more detail, refer to: [Initial BoP based on Comparisons: the Process](#) and [Initial BoP based on Simulations: the process](#)

# Specification of the NOMINATED Forms of BoP

## Specification of Inlet Air Restriction:

The potential performance of engines may be controlled by maintaining or varying such parameters as induction air supply.

The performance of vehicles may be controlled by setting and varying any performance-limiting restriction as applied to engine air intake, such as by specifying a level of engine air induction inlet restriction at the throttle body, and by specifying a level of engine forced air induction boost pressure.

Inlet Air Restriction (IAR) is utilised as performance control because

- IAR is relatively cheap to implement and measure
- IAR may be readily created as a regulation
- IAR may be measured at each race meeting
- the IAR directly affects the most critical area of a vehicle's performance.
- the application of a variation in IAR still allows a high degree of vehicle development and setup variation.

As a basis for creating performance parity, and as a base for further BoP controls, any air intake restriction is required to be nominated by and specified by the competitor prior to competing within the Series.

Where induction Air Restriction is chosen as a Form of BoP, only one of the 2 methods described below should be chosen to be applied as BoP, being Throttle Body restriction or Forced Induction air restriction.

For BoP purposes, where such restriction is chosen by the competitor, the CM may approve and then specify the method, application, and measurement of such BoP as and where appropriate.

Where this occurs, the vehicle must be set to and be able to be maintained at that specification, and be able to be measured and be found to comply.

To verify compliance, the competitor must ensure that an appropriate inlet air restriction measurement device is available, and that Compliance may be verified by an inspecting Official.

## Engine forced air induction Restriction: Boost Pressure Restriction (BPR)

For engines with forced air induction, the restriction of the inlet pressure and therefore volume of air to the engine through the intake manifold will reduce vehicle performance. The specification of the maximum Boost Pressure then determines the performance potential of the engine.

### ***Turbocharged engines:***

#### **BoP Nominations:**

Note that, because turbocharged engines utilise exhaust gas pressure and flow to spin up a turbine to increase the intake air pressure in the air intake manifold, the increase in air flow to the engine and its degree of power increase is not directly nor linearly related to Throttle Position or Engine rpm.

Therefore, where BPR is nominated as a form of BoP for a Turbo engine, neither TPR nor MER may be nominated as an alternative form of BoP - only MRW may be nominated and utilised as an alternative form of BoP

**Control:** BoP Controls will require variation of the boost pressure.

**Control Point:** Boost Pressure control such as wastegates coupled with inlet air restrictions.

**Measurement:** Boost Pressure will be measured within the engine air inlet manifold as the **maximum Absolute Air Pressure at that time relative to Vacuum**, expressed in BAR to 2 decimal places.

**Measurement device:** MSE BM2012 Boost Monitor from “Motor Sport Electronics” [www.msedata.com.au](http://www.msedata.com.au). The unit must be produced post 2012, with no driver-operated controls.

**Device Location:** within the vehicle such that it is operational for all competitive sessions and that data is readily accessible by the competitor and event officials at any time during a race meeting.

**Least Level of Restriction:** The maximum level of Boost pressure provided to the engine is to be nominated by the Competitor as the BoP “starting point”, and this maximum level must be able to be measured and verified as a reasonable starting point.

**Greatest Level of Restriction:** The BoP “finishing point” is Nil boost, **or circa 1 BAR**. Another pressure may be nominated by the Competitor, or not, because the control is self-limiting.

**Expression of BoP Requirement: Increments of change:**

1. Initial increment: 0.10 BAR
2. Second increment: 0.10 BAR
3. Third increment: 0.10 BAR
4. Fourth increment: 0.05 BAR
5. Fifth increment: 0.05 BAR
6. Sixth and subsequent increments: 0.02 BAR

**Data Sampling for Measurement**

- Data will be interpreted over a 3 second period of ON Boost data.
- The 3 second period will be taken from a post throttle application spike where the throttle has remained fully open.
- The data will be averaged over this 3 second period using the average determined by the MSE unit software
- A measurement interpretation tolerance will be used to allow for any interpretation variance from the MSE Unit average.

**Measurement Interpretation Tolerance:** Nil:

**Compliance Verification:**

- If the Competitor cannot utilise Boost Monitor data to verify that the vehicle has complied, then non-compliance exists and Penalties will be applied.

### ***Supercharged engines:***

**Control:** BoP Controls will require control of the boost pressure according to the Controls described within: [Turbocharged engines](#).

Where that cannot be effectively achieved, control is to be achieved using the controls described in either the [Engine Air Induction inlet Restriction: Throttle Body](#) or the maximum engine rpm using [Specification of maximum engine RPM](#).

## **Engine Air Induction inlet Restriction: Throttle Body – Throttle Position Restriction (TPR)**

The restriction of air to the engine through the throttle body may reduce vehicle performance. The specification of the limiting method and degree of the throttle body opening then determines the performance potential of the engine.

**Control:** BoP will vary the degree of inlet restriction to engine air flow through throttle body when venturis are fully open.

**Control Point: Throttle Position (TP):** when the throttle is fully opened by the Driver, the Gap between the Butterfly or Slide and the Venturi wall indicates the amount of air provided to the engine for combustion. This gap may be either manually controlled or electronically controlled.

**Measurement device:** The venturi gap may be physically measured, or the gap may be electronically measured by Data reference.

Measurement of TP is normally provided by a Throttle Position Sensor (TPS) and recorded by the ECUs and Data Loggers as fitted to the vast majority of Prototypes. Measurement and Verification must be effected using data as made available that represents Maximum Throttle opening during the competitive session, where Maximum Throttle opening as achieved by the driver during the race is expressed as a percentage of full throttle (being 100%).

Where an engine management system cannot control TP and cannot record the degree of throttle opening, the control and measurement of Venturi Gap must be effected manually to the satisfaction of the Officials.

**Least Level of Restriction:** BoP “starting point” is Air intake Venturis fully open (maximum gap, 100%), and this aperture need not be nominated.

### **Greatest Level of Restriction:**

The BoP “finishing point” is Nil mm venturi opening which is fully closed or 0% open. A value may be nominated by the Competitor, or not, because the control is self-limiting.

### **Expression of BoP Requirement**

BoP increments as accumulated, and stated as a BoP Requirement in the BoP Sheet, will be expressed as a percentage of allowable Throttle Opening: for example 85%.

**Increments of change:** For normally aspirated engines using electronically controlled TP:

1. Initial increment: 10%
2. Second increment: 5%
3. Third increment: 5%
4. Fourth increment: 3%
5. Fifth increment: 3%
6. Sixth and subsequent increments: 2%

**Increments of change:** For supercharged engines using electronically controlled TP:

1. Initial increment: 20%
2. Second increment: 10%
3. Third increment: 10%
4. Fourth increment: 5%
5. Fifth increment: 5%
6. Sixth and subsequent increments: 3%

**Increment of change:** For normally aspirated engines using manually controlled TP:

7. Initial increment: 4 mm
8. Second and subsequent increments: 2 mm

### **Measurement Tolerance:**

For electronically controlled TP: 1%

For manually controlled TP: 0.5 mm.

## Specification of Minimum Race Weight (MRW) as a nominated form of BoP:

Practically, Racing Weight is the “dry” weight of the vehicle (including engine fluids etc) plus the weight of the driver and residual fuel and any ballast that is required to be carried, as measured at the conclusion of a competitive session.

Minimum Race Weight (MRW) is the prescribed minimum weight that a vehicle must always exceed after finishing a qualifying or race session, as described in the MA Regulations.

Based on information provided by the competitor, the CM shall record an initial “Lowest Level” MRW to reflect the typical weight of driver, fuel, and other components at the conclusion of a race.

This initial MRW shall be without Ballast, and must be verifiable. The initial “Lowest Level” MRW is utilised as a basis for application and variation, up to a competitor-nominated “Highest Level” MRW.

MRW is utilised as performance control because:

- MRW is relatively cheap to implement and measure
- MRW exists as a regulation
- MRW may be measured at each race meeting
- the MRW affects all areas of a vehicle’s performance.
- the application of a variation in MRW still allows normal vehicle development and setup variation.

So as to conform to MRW as a vehicle performance control, for BoP purposes weight in any form may be applied as ballast. The competitor must be prepared to add or remove ballast, as required, so as to be readily able to conform to MRW variations for an event.

For safety reasons, the competitor must nominate the greatest or “Highest Level” MRW for their vehicle so that BoP as applied, will not exceed that weight.

The competitor may at any time elect to vary their nominated “Highest Level” Minimum Race Weight for their vehicle.

Scales and vehicle inspections will be utilised to verify that the vehicle complies with the specification.

To verify compliance, the competitor must ensure that an appropriate weight measurement device is available.

Where weight as ballast has been added by the competitor, the fitment of such weight as added must be in a manner to conform with the requirements described in the MOTORSPORT AUSTRALIA (MA) Manual: **Definitions Technical** for **Ballast Retention**, or directly fixed by welding,

Before the vehicle may compete in a Race Meeting, the form of fitment must be found acceptable with respect to vehicle safety by the Chief Scrutineer of the Race Meeting.

**Control:** BoP will vary the Minimum Race Weight (MRW).

**Control Point:** gross mass of vehicle and driver as weighed on scales after completion of a track session

**Least Level of Restriction:** BoP “starting point” as nominated by the Competitor, being the “Lowest Level” MRW to reflect the typical weight of vehicle, driver, fuel, and other components

**Greatest Level of Restriction:** BoP “finishing point” is “Highest Level” MRW, to be nominated by the Competitor.

**Measurement Tolerance:** 2 kg

**Increment of change:** 10 kg

## Specification of maximum engine RPM (MER):

The potential performance of engines may be controlled by maintaining or varying such parameters. Maximum Engine RPM (MER) is utilised as Performance Control because

- MER is relatively cheap to implement and measure
- MER may be readily created as a Regulation
- MER may be measured at each Race Meeting
- the MER affects the critical area of a vehicle's performance.
- the application of a Variation in MER still allows a high degree of Vehicle development and Setup variation.

As a basis for creating performance parity, as a base for further BoP controls, the MER is either set by the CM by Class Regulation, or is required to be nominated by and specified by the Competitor prior to competing within the Series. Where this occurs, the vehicle must be set to and be able to be maintained at that specification, and be able to be measured and be found to comply.

For BoP purposes, the competitor must nominate their preferred method of restriction, their initial level of restriction, and their preferred maximum level of restriction. Additionally, they must provide their methods of measurement of such restriction, and the device(s) utilised to measure the restriction. To verify compliance, the competitor must ensure that an appropriate peak engine rpm measurement device is available.

Note that MER is only intended to be applied where accelerating in intermediate gears – not top gear. This is so that there is no need for any gear ratio changes nor any gearing or rpm limitations to top speed as a result of MER restriction. Therefore the Maximum Engine Rpm (MER) limit must be applied in all gears except top gear, where the MER can be optionally applied as BoP or not. This option must be nominated initially, then consistently applied.

MER limits do not apply to variation in rpm consequent to throttle blipping when rev-matching gears when downshifting.

**Control:** BoP will vary the Maximum RPM (MER) permitted in intermediate gears under acceleration:

**Control Point:** Engine rpm limiter and /or Data records

**Least Level of Restriction:** BoP “starting point” as nominated by the Competitor, being Max rpm.

**Greatest Level of Restriction:** BoP “finishing point” may be a lower level of Max rpm which may be nominated by the Competitor, or not, because the control is self-limiting.

**Measurement Tolerance:** 100 rpm

**Increments of change:**

1. Initial increment: 1000 rpm
2. Second and subsequent increments: 500 rpm

## Specification of other Vehicle Attributes:

Specification of any performance-linked attribute of a vehicle may be utilised as a performance Control where deemed appropriate. So as to conform to such Attribute Specification as vehicle performance control, any performance-enhancing or limiting attribute of a vehicle may be controlled in such a manner so as to limit the potential performance of that vehicle. The Competitor must seek approval and authorisation for such a control from the CM. Where such Controls have been approved, and implemented by the competitor, before the vehicle may compete in a race meeting, the application of such Control must be in a manner found acceptable with respect to vehicle safety by the Chief Scrutineer of the Race Meeting.

# Review of BoP:

The application of Performance Parity using BOP is described as part of the Series Sporting Regulations and Series documentation as published, and is regulated by Motorsport Australia (MA). BoP Controls override all other technical regulations regarding vehicle specification. BoP Controls are listed within and published as the document titled: "BoP Sheet". The competitor may submit a request for a review of BoP using the Form titled: via the "APS – BOP Competitor Request for BOP Review FORM".

Further, the APS will conduct an annual Review of the BoP System after the conclusion of the racing season, and may individually review the application of individual vehicle BoP.

## Technical Information Form: required information:

Technical information is required to be provided using the Form titled: "APS - BOP Nomination FORM".

This Form provides information to the CM as indicated earlier in this document, and as indicated below. Such information is required to be provided by the Competitor so that BoP may be initially created, be applied and checked, and then varied for each vehicle and driver:

- 1) Competitor and Driver Information:
- 2) Vehicle Information:
  - a. Make of the vehicle
  - b. Model of the vehicle
  - c. MA Log Book Number
  - d. Race Number
  - e. Motorsport Australia vehicle Group/Type
  - f. APS Class
  - g. If Forced Induction: Type of
- 3) Induction Restriction Information
  - a. If Normally Aspirated:
    - i. Throttle Body: Nominated Induction Restriction type and current status and preference of Restriction:
  - b. If Forced Induction: Boost Pressure
    - i. Nominated Preferences
    - ii. other pertinent engine information
- 4) MRW Information: Nominated Preferences
- 5) Maximum engine RPM information: Nominated Preferences

## Initial BoP based on Comparisons: the Process:

The CM may direct that the Competitor must replicate, in advance of competing in the Series, what would happen as part of the normal BoP process at competitive Series events so as to achieve the intended sporting parity. Effectively, the Competitor must perform a practical comparison of the performance characteristics of an acceptable known vehicle (as a Standard for comparison) with the new Competitor and/or a new vehicle (Comparison vehicle). Using this comparison, the new vehicle is BoP'd to become relatively equivalent in performance to the standard of other BoP'ed vehicles before it's first Series event.

### The Process of establishing an initial level of BoP:

- Where so advised by the CM, and before an Event Entry will be accepted, the Competitor must
  - initiate suitable interaction between the Competitor and the CM, so that agreement may be reached.
  - Nominate to the CM the details of:
    - The Track
    - The Standard vehicle  
This is to be a vehicle currently competing, and with a history of completion results, and as already BoP'ed to become relatively equivalent to other competing vehicles.
    - The Comparison vehicle  
The new-to-the-Series vehicle to be compared with the Standard.
    - The Driver  
A suitably competent professional race car driver.
  - Obtain acceptance by the CM
- The Competitor shall then organise
  - a back to back comparison test of each nominated vehicle using the nominated Driver at the nominated track on the same day
  - to refer to the the Technical Information Form, so as to establish the most preferred forms and increments of BoP that may be applied.
  - to then effectively have increments of BoP applied on that day in a progressive manner so that the Comparison vehicle is effectively brought back to lap times that are equivalent to the Standard vehicle, or less.
    - To record that BoP as applied to the Comparison vehicle.
  - to provide to the CM
    - A completed Technical Information Form
    - The forms and level of BoP as applied so as to create equivalence.
    - Verification that the lap times of the Standard and Comparison vehicles are equivalent, providing Lap Times and Video and other supporting Data as and where appropriate.
- The CM will
  - Advise the Competitor of the Outcomes
  - Record the BoP Forms and Increments as applied consequent to the comparison process.
  - Accept a Race Meeting Entry as provided by the Competitor for that meeting and track.
- The Competitor will
  - Apply the established BoP according to normal protocols
  - If unhappy with the outcomes of the Process, discuss their concerns with the CM.



## Initial BoP based on Simulations: the Process:

The CM may direct that the Competitor, in advance of competing in the Series, utilise the services of a third-party entity to use a chassis performance simulator (chassis sim, or Sim) so as to predict performance outcomes for that vehicle under different scenarios, with suitable BoP to be established and implemented prior to the commencement of competition in the Series.

### **The Process of establishing an initial level of BoP:**

- Where so advised by the CM, and before an Event Entry will be accepted, the Competitor must
  - initiate suitable interaction between the Competitor and the CM, so that agreement may be reached.
  - so that a chassis simulation may be properly conducted, and so that the relevant level of initial may be BoP then established.
- The Competitor is to provide to the CM in a timely manner:
  - An undertaking to meet all billable charges associated with the Process.
  - A completed Technical Information Form, to include at least two preferred Forms of BoP, with each such form prioritised as to order of application.
  - For the vehicle in standard racing setup, the specification of vehicle components that relate to aero, engine and chassis performance; and other relevant performance capability and data.
  - The relevant contact details of the Competitor, to be provided to the Entity that performs the Sim, so that Entity may be able to directly request further details from the Competitor.
  - The nomination of the first intended Race Meeting and the Race Track at which the Competitor will participate in that vehicle.
- The CM will
  - Establish nominate a suitable Median Lap Time (MLT) that is pertinent to the Race Track as nominated by the Competitor, to be used a reference lap time for the chassis sim.
  - Provide the relevant information and instructions to the third-party entity.
- The third-party entity will, for that track,
  - Perform the chassis sim, and establish a predicted lap time for that vehicle at that track.
  - Compare the predicted lap time for the vehicle in Standard setup with the supplied MLT, and obtain a Difference.
  - Where that Difference is less than 1 second per lap, no more Sims need be performed, and the CM is to be notified.
  - Where that difference is more than 1 second per lap and the lap time is quicker than the MLT, the chassis sim is to be performed again.
  - The most preferred Form of BoP is to be applied in increments to the Sim, according to the upper and lower limits in the Technical Information Form, until the predicted lap time is within 1 second per lap of the MLT.
  - Where the sim cannot achieve the MLT using the most preferred Form of BoP, then the next preferred Form of BoP is to be also applied to the Sim in turn, until the reference MLT time is achieved.
- The third-party entity will, having achieved a suitable level of BoP, or not,
  - notify the CM of the sim outcomes.
  - invoice the Competitor for the costs associated with the process.
- The CM will
  - Advise the Competitor of the Outcomes
  - Record the BoP Forms and Increments as applied in the sim that achieved the intended MLT target.
  - Accept a Race Meeting Entry as provided by the Competitor for that meeting and track.
- The Competitor will
  - Apply the established BoP according to normal protocols
  - If unhappy with the outcomes of the Process, discuss their concerns with the CM.