



# ENGINEERING REPORT

2020 Toyota Supra Performance Air Intake | SKU: MMAI-SUP-20

By Ye Liu, *Mishimoto Engineer*

## REPORT AT A GLANCE

- **Goal:** Create a direct-fit, high-quality intake for the 2020 Toyota Supra.
- **Results:** The Mishimoto performance intake showed 17.4% less restriction on the flow bench compared to the stock intake.
- **Conclusion:** The Mishimoto performance intake is an ideal bolt-on upgrade for the 2020 Toyota Supra owners looking to improve engine airflow and intake sound.

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## DESIGN OBJECTIVES

The design requirements assigned to this project are as follows:

- Improve airflow while maintaining safe air/fuel ratio without custom tuning.
- Durable design that will last the lifetime of the vehicle.
- Easy bolt-on installation without any permanent modification done to the vehicle.
- High-quality intake tone.
- Compatible with Mishimoto charge pipe.
- Compatible with strut tower braces.

## MATERIAL SELECTION

The material used for the rotational-molded airbox and intake tube is XLPE (Cross-Linked Polyethylene) plastic. XLPE material demonstrates high-impact strength, excellent heat resistance, and is UV-stable. The flexible grommet that connects the intake tube to the airbox is made of injection-molded silicone rubber material that can withstand engine bay heat up to 350°F. The silicone intake tube coupler has a layer of FVMQ (Fluorosilicone) lining that demonstrates excellent fuel and oil resistance.

## DESIGN AND FITMENT

The stock intake system of the Supra has quite a few extra features compared to most other stock intakes that have come through our R&D facility. While resonators are common to see on modern OEM intakes, the size of the resonator on the

Supra intake is the largest we have seen. More than half the size of the airbox, this resonator takes up a large chunk of the space that could be used to accommodate a high-flow conical air filter. Rather than just deleting it to gain the extra room we needed, a series of dyno tests are performed to confirm that removing the resonator does not negatively impact performance.

Integrated heat protection is another feature that is unique to the Supra's intake system. The Supra intake is located directly on top (and to the passenger side) of the turbo and exhaust manifold. A stamped aluminum heat shield bolts directly onto the side of the lower airbox. More dyno tests are done to investigate the effectiveness of the heat shield, showing a 4-6F degree reduction on intake air temperatures with the heat shield configuration. Based on this, we incorporated a two-piece heat shield for the Mishimoto intake.

The initial prototype we created replaces only the corrugated section of the stock intake tube. The rigid plastic section of the stock intake tube has two sound muffler chambers inside, a vacuum fitting, and is connected to the turbo snout by a quick-disconnect coupling design. Flow bench tests revealed that this section of the intake tube does not add flow restriction in the system, but it does dampen intake and turbo sound significantly. Based on this finding, we created a new tube design replacing this section, which produced much better sound quality.



FIGURE 1: Stock intake.



FIGURE 2: Mishimoto intake heat shield design.



FIGURE 3: Mishimoto intake production sample installed.



FIGURE 4: Mishimoto intake production sample (left) and stock intake (right).

### SOUND TESTING

The Mishimoto performance intake provides a loud and deep intake tone that is pleasing to the ear and pronounces the sound of turbo spool. We recorded stock and Mishimoto intake sounds during dyno testing, which can be found on our Engineering Blog at

<https://www.mishimoto.com/engineering>

### PERFORMANCE TESTING

Performance testing was performed on our in-house DynaPack dynamometer with all dyno runs conducted in 6th gear. The Mishimoto intake did not demonstrate significant power or torque gain over the stock intake on the dyno. However, flow bench testing showed that the intake is 17.4% less restrictive than its stock counterpart. While The Mishimoto intake is compatible with the stock tune, with newer vehicles' torque-based ECU strategy, custom tuning may be required to tap into the airflow potential fully.

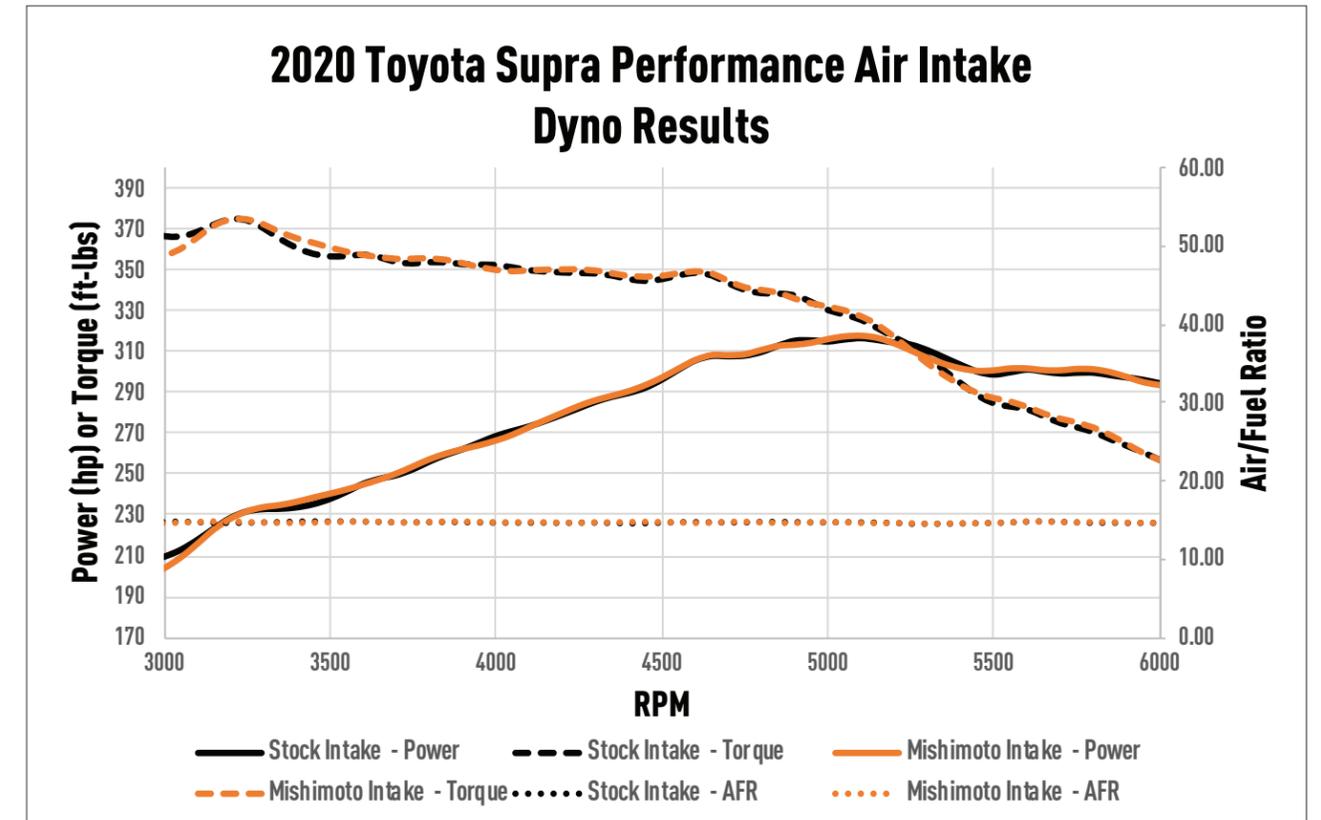


FIGURE 5: Dyno results.

## 2020 Toyota Supra Performance Air Intake Flow Bench Comparison

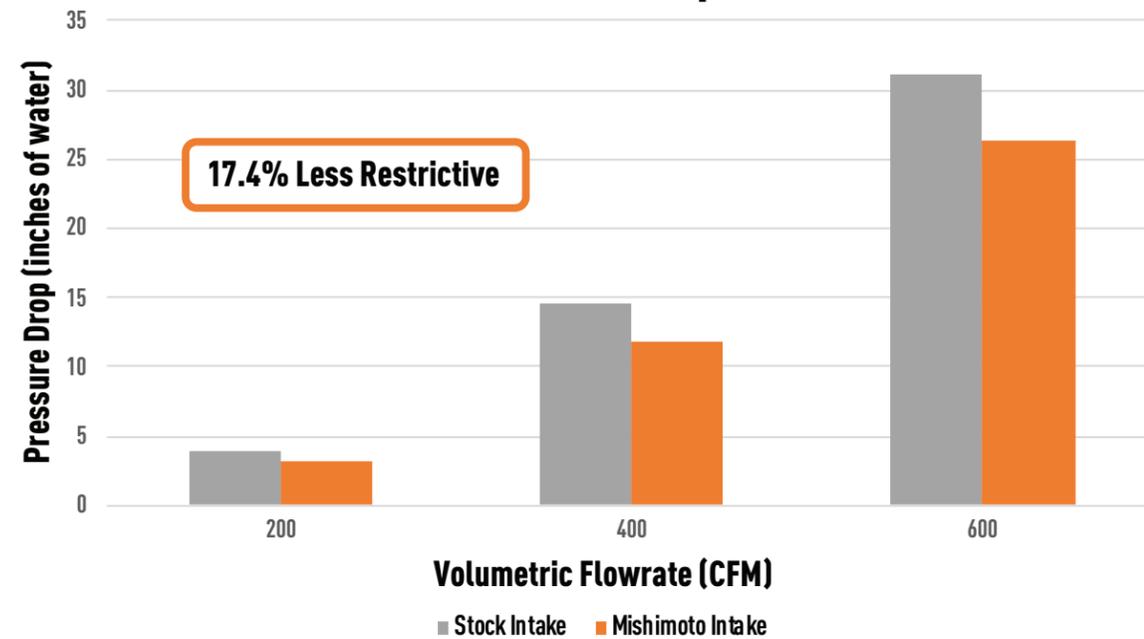


FIGURE 6: Flow bench results.

### INSTALLATION NOTES

The Mishimoto performance air intake is an excellent bolt-on upgrade for the 2020 Toyota Supra and can be installed on a stock vehicle without any permanent modification.

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