

## **Carbon Flash Stage 3 Winglets for Grand Sport**

### **A Splitter Increases Downforce and Looks Cool!**



At the speeds I mostly travel, a Splitter is not doing much other than looking good!

Aerodynamics is complex; NASCAR, F-1, manufacturers etc., spend thousands of hours and millions of dollars in wind tunnels and computational aerodynamics computer time because it is not intuitive!

The front Splitter serves to increase the amount of downforce at the front of the car. Air flow is brought to stagnation above the Splitter causing an area of high pressure. Below, the front Splitter air is redirected away from this stagnation point and accelerates air under the

car, which in turn causes a low pressure area. High pressure over the Splitter and the low pressure caused by the airflow under the car create downforce.

**SPLITTER END PLATES** (also called Winglets): End Plates help trap more of the high pressure air on top of the Splitter giving more downforce at the front of the car. The End Plates help stop the high-pressure air on the top of the wing from being encouraged to roll over the end of the wing to the low-pressure air beneath, causing induced drag. They also change the shape of the vortices that occur at the end of the Splitter and help reduce drag caused by the turbulences that are generated by the front wheels.

For the Grand Sport the Stage 2 Aero package ordered has small end plates (pic right.) They are so small, wonder how effective they are? There are Stage 3 winglets available used to increase effectiveness.

A Z07 has the option of using the supplied smaller or larger End Plates so they, along with the adjustable wicker bill on the rear spoiler can be used to adjust the cars downforce balance at various tracks.



The Stage 3 Winglets also have a major function for me. It helps integrate the “spats” that the Grand Sport (and Z06) use to handle the wider front tires (285 versus 245 in the base and Z51.) Thought the “spats” looked like a cheap add-on! OK for my V8 powered 1974 Jeep Renegade! Could justify that approach for the rag top Jeep but for a Corvette?



Tadge Answered, “Why Spats?” His reason for “spats” versus making wider fenders in my mind made them “look better,” since I accept “*form follows function:*” This is his explanation:

*“All Corvette exterior features and surface shapes are designed for maximum performance and great aesthetics. Around the front wheel openings, both the C6 (Z06, GS and ZR1) and C7 (GS and Z06) feature what you are calling spats arcing down the forward edge. These features create high pressure on the front/top and low pressure on the back/underside resulting in down force and evacuation of hot air from the wheel opening. The aerodynamic studies for both C6 and C7 independently proved their value. To work, they need to be a very specific shape - specifically a sharp break in the surface where the spat meets the fender. I have been asked many times why we couldn't just form that shape from the front fender so it would be all one painted piece instead of looking "tacked on". We looked at that and decided it looked pretty bad when painted bright colors. Your eye is immediately drawn to that feature and it does not look integrated or graceful. Naturally the question is, "If it is so important, why don't we see it on the C7.R race car?" The reason is that the race car sits so low to the ground it can take advantage of even more efficient aerodynamic features such as an "underwing" that sits beneath the front splitter.”*

#### **Invention of End Plates:**

Of interest, airplanes use wing End Plates and are seen, especially on many newer passenger jets. The initial concept dates back to 1897, when English engineer Frederick Lanchester patented wing end-plates as a method for controlling wingtip vortices. In the United States, William Somerville patented the first functional winglets in 1910. Somerville installed the devices on his early biplane and monoplane designs.

Controlling the size of wing tip vortices with the addition of winglets, as they are also called, increased the 747-400's range by 3.5 percent over the 747-300, which is otherwise aerodynamically identical but has no winglets.



**THE FOLLOWING IS A PICTURE REVIEW OF THE INSTALLATION OF STAGE 3 WINGLETS ON THE STAGE 2 AERO PACKAGE ON MY GRAND SPORT**

## Photo Sequence

Bought the Stage 3 Winglets from Corvette Mods for \$199 where the GM product lists for ~\$500. Why the difference? These are made from ABS plastic, painted carbon flash (same as my Aero option) versus carbon fiber for the OEM.

Wondered at first how they would perform then found this info about ABS:

ABS thermoplastic is widely used by automobile manufacturers as original equipment for trim, bumper covers, and some body panels. ABS plastic is more expensive and heavier than fiberglass and has a finish superior. It is a very easy surface to apply paint on. Of interest, LEGO blocks are made from ABS plastic because it is so durable!



The Stage 2 winglets are held in place with 6 mm visible bolts that are screwed into threads formed in the carbon flash painted, carbon fiber splitter.

Bought 30 mm long, 6 mm stainless bolts with a hex head so an open end wrench could be used to tighten them from the exposed underside of the Stage 3 winglets.



The flat plastic splitter bottom screws were removed to check clearance and since they will be replaced with "Splitter Guards" (more on those at the end!)

Little room inside the Stage 3 splitter for washers so an 1/8 inch thick aluminum plate helped support and attach the winglets to the splitter with lock washers. The winglets have two slots that just slip over the bolts. The parts are held in alignment with one hand while the bolts are tightened.

Three of the inner fender bolts are removed and hold the upper portion of the Stage 3 winglet in place.

There was no hardware supplied with the winglets but just as well since I planned to install snaps for a Nylon Bra I had for my 2014. Purchased 1 inch long #10 stainless male snaps from Harvard Marine (bottom of pic) and used two different size washers.



The 1 inch long snap screws (shown installed left) are needed to reach through the winglet supports held the winglet fine. The original screws were shorter as noted in the above pic (black screws with washers.)

Should provide enough clearance to hold the Nylon Bra female snaps. Also bought some snap extensions that will provide the extra length required for the Bra to stretch around the spats/winglets.

The Stage 3 Winglets look fine and does integrate well with the spats. They in combination with the ASC Splash Guards, which are wider and deeper than those from GM all help make the spats look “good!”

Well perhaps you need to consider Tadge’s comment about the spats aerodynamic function to use the word “good!”

When asked why I added them, “*making the spats look better*” will be my answer!







## Splitter Guard Washers

Was concerned about the vulnerability of the carbon flash, carbon fiber splitter as I was with the visible carbon fiber splitter I installed on my 2014 C7.

I had scraped the bottom front edge carbon fiber splitter several times and it was scared.

Saw a unique new product by ZL1 Addons. They are simple steel cone washers that replace the screws holding the plastic bottom aero part of the splitter.

They are supplied with screws that have a #20 Torx head. Makes installation very easy. They supplied three larger cone washers to be placed in the very center and at the splitter ends.

This is a pic of the cone washers installed. The three larger washers extend about  $\frac{1}{2}$  inch below the leading edge of the splitter. I was creating a higher chance of hitting!



Looking at the results, had two additional concerns:

**FIRST:** They would not solve the scraped bottom front edge issue I had with my C7 carbon fiber splitter and

**SECOND:** That shape edge could grab an obstacle either going forward or if backing off say of a cement tire stop. That would cause more damage!

As mentioned the three larger cone washers supplied also protruded about  $\frac{1}{2}$  inch below the splitter. This reduced clearance. .

**WAS THERE A BETTER PROTECTOR?**



### Found Unique Product from Scrape Armor

This product is made of a slippery plastic and has a patented shape that reduces sliding friction and prevents it from grabbing.

It installs easily using mostly the OEM screws holding the splitter undertray.

Pic left if the finished install. It fits snug behind the splitter leading edge and protrudes less than ¼ inch.

This is a PDF of my install:

[http://netwelding.com/Splitter\\_Protectors.pdf](http://netwelding.com/Splitter_Protectors.pdf)



### “Protector” on *C7 Bumper* *Without a Splitter*



The pic left was taken from the *Scrape Armor* website and shows the product protecting a C7’s protruding front bumper.

That can be an issue, especially when pulling up to a concrete tire stop, which those of us with splitters know is “dangerous and avoid!”

In fact, before I installed the splitter on my 2014 C7, had a minor scrape of the bottom side of its bumper. It occurred when it hit a low curb while turning the steering wheel too soon exiting a parking space next to an island!

### Buying *SCRAPE ARMOR* Protector

The Website right provides more info on the product.

You can order direct from them and try the discount code: **Vette30** for a 30% Discount.

If it’s not current email Jerome at: [jeromep@scrapearmor.com](mailto:jeromep@scrapearmor.com) and see if there is a discount code available.



Or Call: 1-844-667-2727

Other 2017 Grand Sport & 2014 Stingray PDF's Available:



*Some 40 items discuss improvements or information about a 2017 Grand Sport and 2014 Stingray function and/or esthetics. Some are minor and others, like the installing ceramic brake pads, include detailed install information.*

*Below are the PDF's available. Click on picture (may need Ctrl pressed.) Or just copy and paste the PDF info (Blue type) into your browser. Or email me at [GUtrachi@aol.com](mailto:GUtrachi@aol.com) and state the title desired, shown in Yellow:*

**Note:** GS indicates the info was updated from that available for the C7 Z51 PDFs.

### **Rusty GS/C7 Muffler**

*Why the C7 muffler is rusted and a simply way to make rust turn matte black.  
Bottom pic rusted, top pic treated*

[http://netwelding.com/Muffler\\_Rust.pdf](http://netwelding.com/Muffler_Rust.pdf)



### **Change GS/C7 Oil**

*WHY change your own oil and HOW to do it  
Revised, includes C7 Lifting Methods*

[http://netwelding.com/Changing\\_Oil.pdf](http://netwelding.com/Changing_Oil.pdf)



### **C7 Carbon Fiber Side Skirts**

*How to install side skirts with jacking information for  
DIY's without lifts*

[http://netwelding.com/Side\\_Skirts.pdf](http://netwelding.com/Side_Skirts.pdf)



### **C7 Carbon Fiber Splitter w/End Plates**

*How to install Splitter & Nylon bra fit*

[http://netwelding.com/CF\\_Splitter.pdf](http://netwelding.com/CF_Splitter.pdf)



### **C7 Removing GM Plastic Film**

*How To Remove The Rocker Panel Film*

[http://netwelding.com/Rocker\\_Panel\\_Film.pdf](http://netwelding.com/Rocker_Panel_Film.pdf)



### **GS/C7 Mirror Proximity Alarm**

*Limit switch alarm warns when passenger mirror is too close to door frame*

[http://netwelding.com/Mirror\\_Proximity\\_Alarm.pdf](http://netwelding.com/Mirror_Proximity_Alarm.pdf)



### **Jacking Pads for GS/C7**

*Jacking Pads must 2 1/2 inch max OD. Made four. Bought 2 1/2 inch OD x 2 inch high pads after installing side skirts; Bought pads right for the GS.*

[http://netwelding.com/Jacking\\_pads.pdf](http://netwelding.com/Jacking_pads.pdf)



### **GS/C7 Radar Power**

*For C7 tapped rear fuse panel. For GS tapped mirror*

[http://netwelding.com/Radar\\_Detector\\_Power.pdf](http://netwelding.com/Radar_Detector_Power.pdf)



### **GS/C7 Belt Rattle**

*Passenger seat belt rattles against the seat back. The solution, add a shoulder belt pad.*

[http://netwelding.com/Eliminate\\_Rattle.pdf](http://netwelding.com/Eliminate_Rattle.pdf)



### **Aluminum C7 Chassis and Weld Repair**

*The C7 has an all aluminum chassis, made from 117 welded pieces*

[http://netwelding.com/Aluminum\\_Chassis.pdf](http://netwelding.com/Aluminum_Chassis.pdf)



### **GS/C7 Ceramic Brake Pads**

*The Z51 has very dusty brakes. These pads help!*

[http://netwelding.com/Ceramic\\_Pads.pdf](http://netwelding.com/Ceramic_Pads.pdf)



### **GS/C7 License Plate Frame;**

*Must Meet South Carolina Law*

[http://netwelding.com/License\\_Plate\\_Frame.pdf](http://netwelding.com/License_Plate_Frame.pdf)



### **Manage GS/C7 Spilled Gas**

*Protect the side of the Vette when filling up with gas*

[http://netwelding.com/Manage\\_Spilled\\_Gas.pdf](http://netwelding.com/Manage_Spilled_Gas.pdf)



### **GS/C7 License Plate & Cargo Lights**

*LED license plate light & cargo area bulbs are brighter and whiter*

[http://netwelding.com/License\\_Plate\\_Light.pdf](http://netwelding.com/License_Plate_Light.pdf)



### **GS/C7 Rear Cargo Area**

*Rear cargo area needs storage device and rear protector*

[http://netwelding.com/Rear\\_Cargo\\_Area.pdf](http://netwelding.com/Rear_Cargo_Area.pdf)





### **GS/C7 Door Panel Protector**

*Black plastic protector added to prevent scuffing of door when exiting*

[http://netwelding.com/Door\\_Panel\\_Protector.pdf](http://netwelding.com/Door_Panel_Protector.pdf)



### **GS/C7 Improved Cup Holder**

*A solution to the cup holder spilling under hard braking or sharp turns.*

[http://netwelding.com/Improved\\_cup\\_Holder.pdf](http://netwelding.com/Improved_cup_Holder.pdf)



### **GS/C7 Wheel Chatter/Hop**

*Why sharp, low speed turns with cold tires causes the front tires to chatter/hop.*

[http://netwelding.com/Wheel\\_Chatter.pdf](http://netwelding.com/Wheel_Chatter.pdf)



### **C7 Carbon Fiber Grille Bar**

*Install genuine carbon fiber grille bar overlay*

[http://netwelding.com/CF\\_Grille\\_Bar.pdf](http://netwelding.com/CF_Grille_Bar.pdf)



### **Jacking a GS/C7 Vette**

*Safely jacking either front only or back & front*

[http://netwelding.com/Jacking\\_A\\_C7.pdf](http://netwelding.com/Jacking_A_C7.pdf)



### **Deer Whistle Installed on GS/C7**

*Do they work? Plus Install Info*

[http://netwelding.com/Deer\\_Whistle.pdf](http://netwelding.com/Deer_Whistle.pdf)



### **Replacing C7 Battery**

*After using a GM type charger and showing fully charged a voltage low, replaced battery with AGM!*

[http://netwelding.com/Battery\\_Issues.pdf](http://netwelding.com/Battery_Issues.pdf)



### **GS/C7 Window Valet**

*Lower Windows with FOB*

*Window Valet Helps 2014/2015 Latch Hatch*

[http://netwelding.com/Hatch\\_Latch.pdf](http://netwelding.com/Hatch_Latch.pdf)



### **GS/C7 Splash Guards**

*GM offers splash guards for the C7 Corvette. An easy DIY installation. ACS Best Front Guards for GS.*

[http://netwelding.com/Splash\\_Guard.pdf](http://netwelding.com/Splash_Guard.pdf)



### **GS/C7 Blind Spot Mirror**

*Smaller rear and side windows cause C7 blind spots. Small "blind spot mirrors" help*

[http://netwelding.com/Blind\\_Spot.pdf](http://netwelding.com/Blind_Spot.pdf)



### **GS/C7 Skid Pad Protector**

*After the air dam, the aluminum "skid pad" hits driveway ramps etc. Plastic protector helps.*

[http://netwelding.com/Skid\\_Pad\\_Protector.pdf](http://netwelding.com/Skid_Pad_Protector.pdf)



### **GS/C7 Wheel Locks**

*Wheel locks, torqued to required 100 ft-lbs, help protect your expensive wheels from theft.*

[http://netwelding.com/Wheel\\_Locks.pdf](http://netwelding.com/Wheel_Locks.pdf)



### **GS/C7 OnStar Lights**

*The OnStar LED's in the rear view mirror, at a quick glance, look like a police car flashing light! This is a fix.*

[http://netwelding.com/OnStar\\_Lights.pdf](http://netwelding.com/OnStar_Lights.pdf)



### **GS/C7 Skip Shift Eliminator**

*Skip Shift Eliminator install with suggestions on jacking a C7.*

[http://netwelding.com/Skip\\_shift\\_Eliminator.pdf](http://netwelding.com/Skip_shift_Eliminator.pdf)



### **C7 Catch Can & Clean Oil Separator**

*Direct inject engines like the LT1, are particularly subject to "coking." What is Coking and how to reduce the potential?*

[http://netwelding.com/Catch\\_Can.pdf](http://netwelding.com/Catch_Can.pdf)



### **GS/C7 Round Shift Knob**

*A round shift knob shortens throw.*

[http://netwelding.com/Shift\\_Knob.pdf](http://netwelding.com/Shift_Knob.pdf)



### **GS/C7 Stingray Sill Plate**

*Stingray sill plate replaces original.*

[http://netwelding.com/Sill\\_Plate.pdf](http://netwelding.com/Sill_Plate.pdf)



### **GS/C7 Nylon Bra**

*Nylon Bra Stops Bugs on Front and Grill. Fits with Stage 3 Winglets*

[http://netwelding.com/Nylon\\_Bra.pdf](http://netwelding.com/Nylon_Bra.pdf)



### **GS/C7 Clutch Fluid Change**

*Clutch fluid after 3000 miles gets dirty*  
[http://netwelding.com/Clutch\\_Fluid.pdf](http://netwelding.com/Clutch_Fluid.pdf)



### **C7 Carbon Fiber Hood Vent**

*Replaces Plastic Hood Vent*  
[http://netwelding.com/Hood\\_Vent.pdf](http://netwelding.com/Hood_Vent.pdf)



### **GS/C7 Cold Air Intake**

*Low Restriction Air Filter & Duct*  
[http://netwelding.com/Cold\\_Air\\_Intake.pdf](http://netwelding.com/Cold_Air_Intake.pdf)



### **Garmin GPS for GS Cubby**

*Garmin Mounts in GS Cubby*  
[http://netwelding.com/GPS\\_In\\_Cubby.pdf](http://netwelding.com/GPS_In_Cubby.pdf)



### **GS Splitter Stage 3 Winglet**

*Stage 3 Winglets Integrate with Spats*  
[http://netwelding.com/Stage\\_3\\_Winglets.pdf](http://netwelding.com/Stage_3_Winglets.pdf)



### **GS 2LT to 2.5 LT**

*Red Upper Dash Pad Like 3LT*  
[http://netwelding.com/Red\\_Dash\\_Pad.pdf](http://netwelding.com/Red_Dash_Pad.pdf)



### **Jake Emblem/Decals for GS**

*Jake Symbols Support GS Racing Image*  
[http://netwelding.com/Jake\\_Emblems.pdf](http://netwelding.com/Jake_Emblems.pdf)



### **GS Splitter Protector**

*Rugged Plastic Protection for Splitter*  
[http://netwelding.com/Splitter\\_Protectors.pdf](http://netwelding.com/Splitter_Protectors.pdf)



### **GS: Vitesse Throttle Controller**

*Adjustable Throttle-by-Wire Control*  
[http://netwelding.com/Throttle\\_Control.pdf](http://netwelding.com/Throttle_Control.pdf)



*May Be Of Interest:*

### **Engineering a ProStreet Rod**

*How Our '34 ProStreet Rod Was Designed and Built  
8.2 Liter Engine, 4 Wheel Disk Brakes & Coilovers*  
<http://netwelding.com/Engineering%20Street%20Rod%203-08.pdf>

