



**RENAULT**

**ARRK | Shapers'**

# Replacing Aluminum with XIRAN<sup>®</sup> SMA-GF Composite on Roller-Blind Sunroof Modules

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# Traditional Roller-Blind Sunroof Modules

- Guided on aluminium profiles
- The Fixed-Glass Sunroof requires 2 separate steps assembly on the vehicle:
  1. Bottom loading and Manual screwing of the Roller-blind module
  2. Top loading and Robot gluing of the Glass panel





# Traditional Roller-Blind Sunroof Modules

- Roller-Blind aluminium profiles

Raw profile



Finished profile



# Traditional Roller-Blind Sunroof Frames

- Disadvantages of Aluminum Rails
  - Aluminum is Expensive
  - Anodizing Chemicals are Costly & Environmentally Undesirable
  - Conversion Process is Long & Costly (Specific Tooling Needed for Each Manufacturing Step)
  - Need cutting, milling, finishing, anodizing...
  - Limited Functionality without Adding Parts & Assembly Operations (therefore More Mass & Cost)
  - Uneven Tolerance when fitted to Glass Panel

# A New Composite Frame Design

- Can Aluminum Guide Rails be Substituted by Thermoplastic Composite & Still Meet OEM Requirements ?
- Webasto Achieved the Challenge thanks to XIRAN® SMA-GF Outstanding Properties

# A New Composite Frame Design

- Rail Functionality & Operating Targets
  - Save Headspace & Daylight Opening
  - Smooth Shade Sliding Requires Constant & Precise Profile Geometry along 1+ meter of Length
  - Solid and Accurate Connection to Module Components & Headliner
  - Tight Tolerance between Rail Curvature and Glass Shape
  - Shade Must Work at Low Sliding Noise to Meet Cabin NVH

# A New Composite Frame Design

- Why Thermoplastic Composite ?
- Webasto Already used XIRAN<sup>®</sup> SMA-GF for Several Top-loaded Sunroof Frames
  - + Stiff, Low Density, Very-Low Warpage, Low Thermal Deformation
  - + No Post-Mold Crystallization, Good Weldability
  - + High Bond Strength to Urethane Adhesives on Glass and Metal
  - + Sustainability, Recyclability



# A New Composite Frame Design

- Injection Molding of XIRAN<sup>®</sup> SMA-GF
  - + High-Precision, Complex Designs
  - + Excellent Capability, Repeatability & Reproducibility
  - + Holes, Cutouts, & Clips Molded in
  - + Higher Functional Integration Than Extrusion
  - Rail Must be Molded in 2 Pieces & Joint



# A New Composite Frame Design

- Teams of

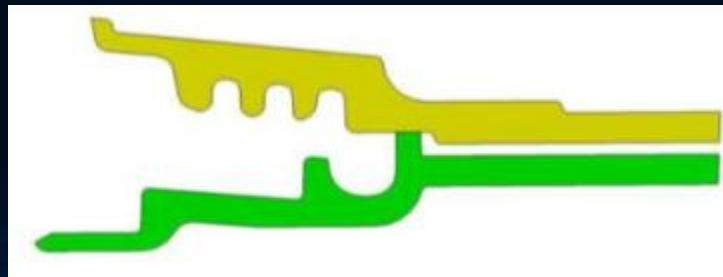
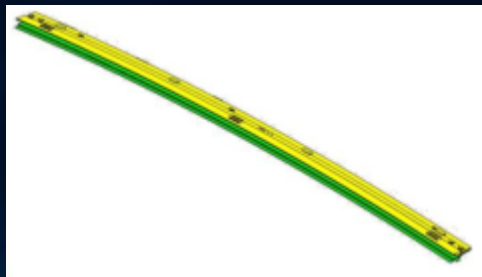
Polyscope, Webasto, Renault, & AARK-Shapers

Worked in Close Partnership to Develop the New  
XIRAN<sup>®</sup> SMA-GF Guide Rail

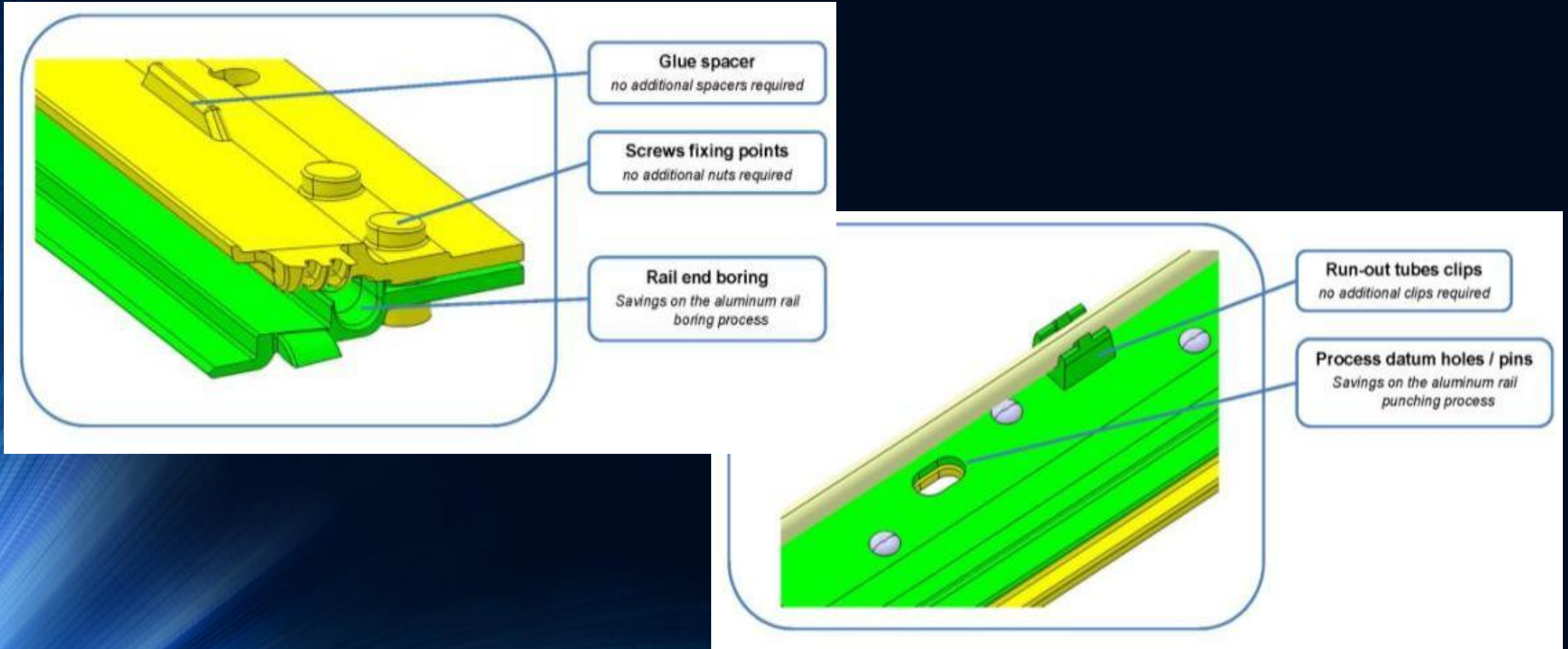
- Design Now Protected by Several Patents

# Upper & Lower Rail Halves Before (*Left*) & After (*Right*) Welding

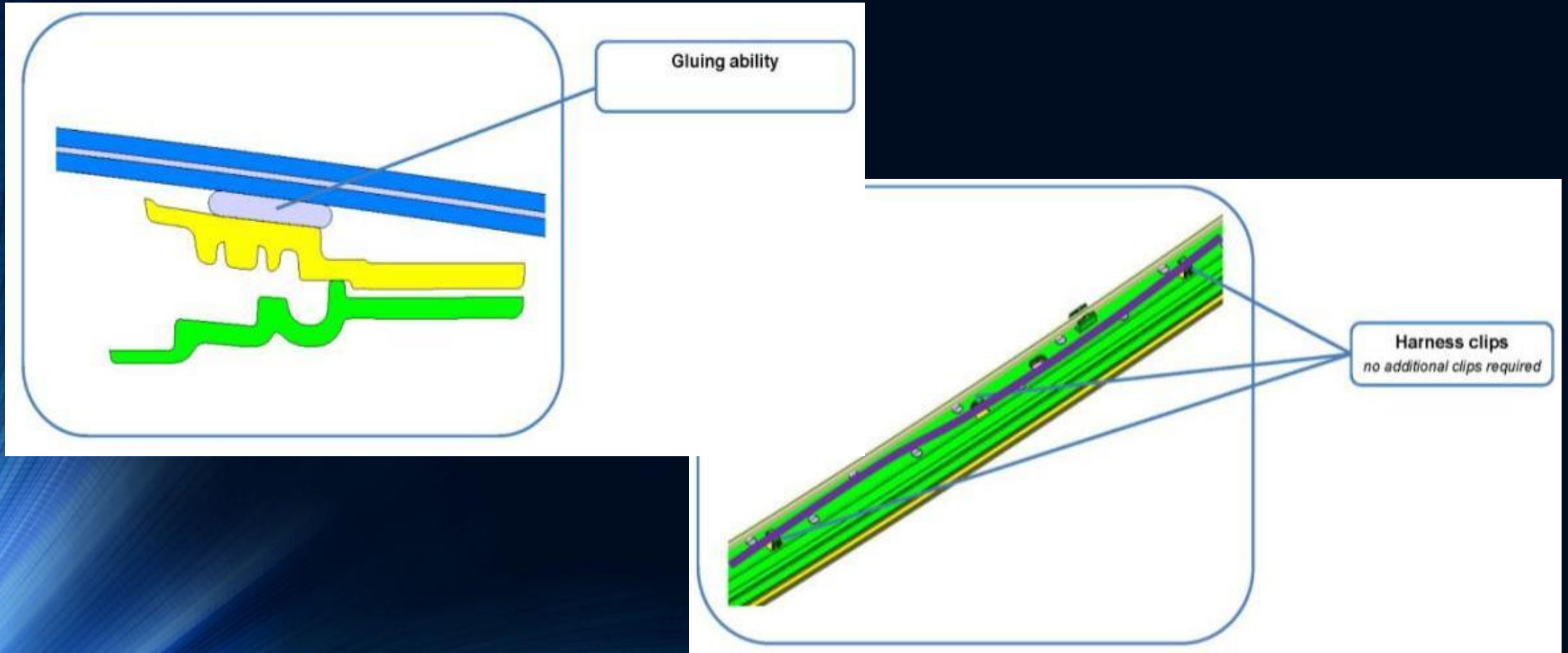
- Each Rail Molded in 2 Pieces & Joint Together
- Designed for both :
  - 5-Seater Scenic
  - 7-Seater Grand Scenic



# Thermoplastic Composite Functional Integration

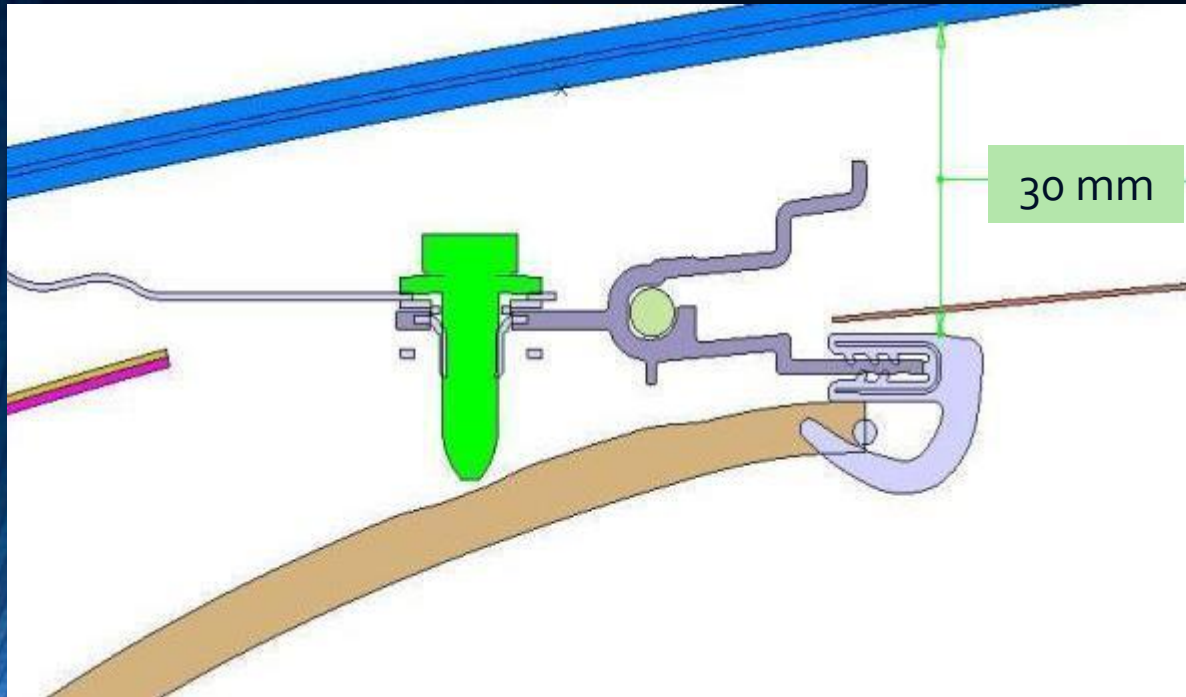


# Thermoplastic Composite Functional Integration



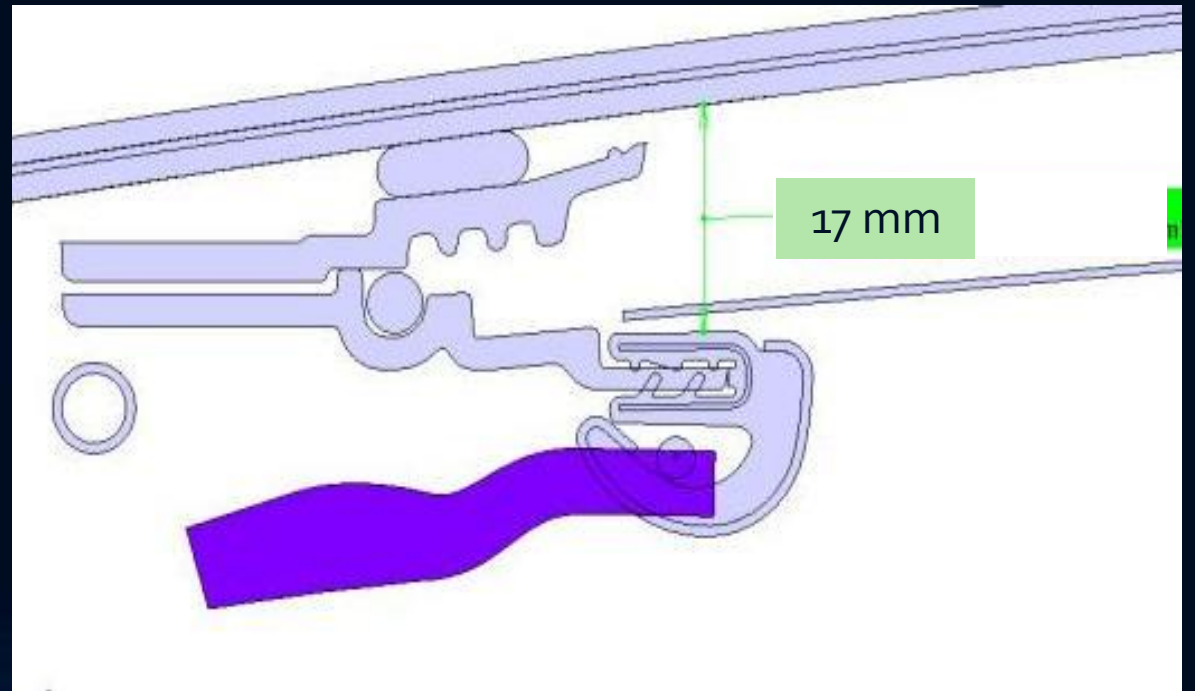


# XIRAN® Rail Z-Axis Stack Reduction of $\approx 13$ mm



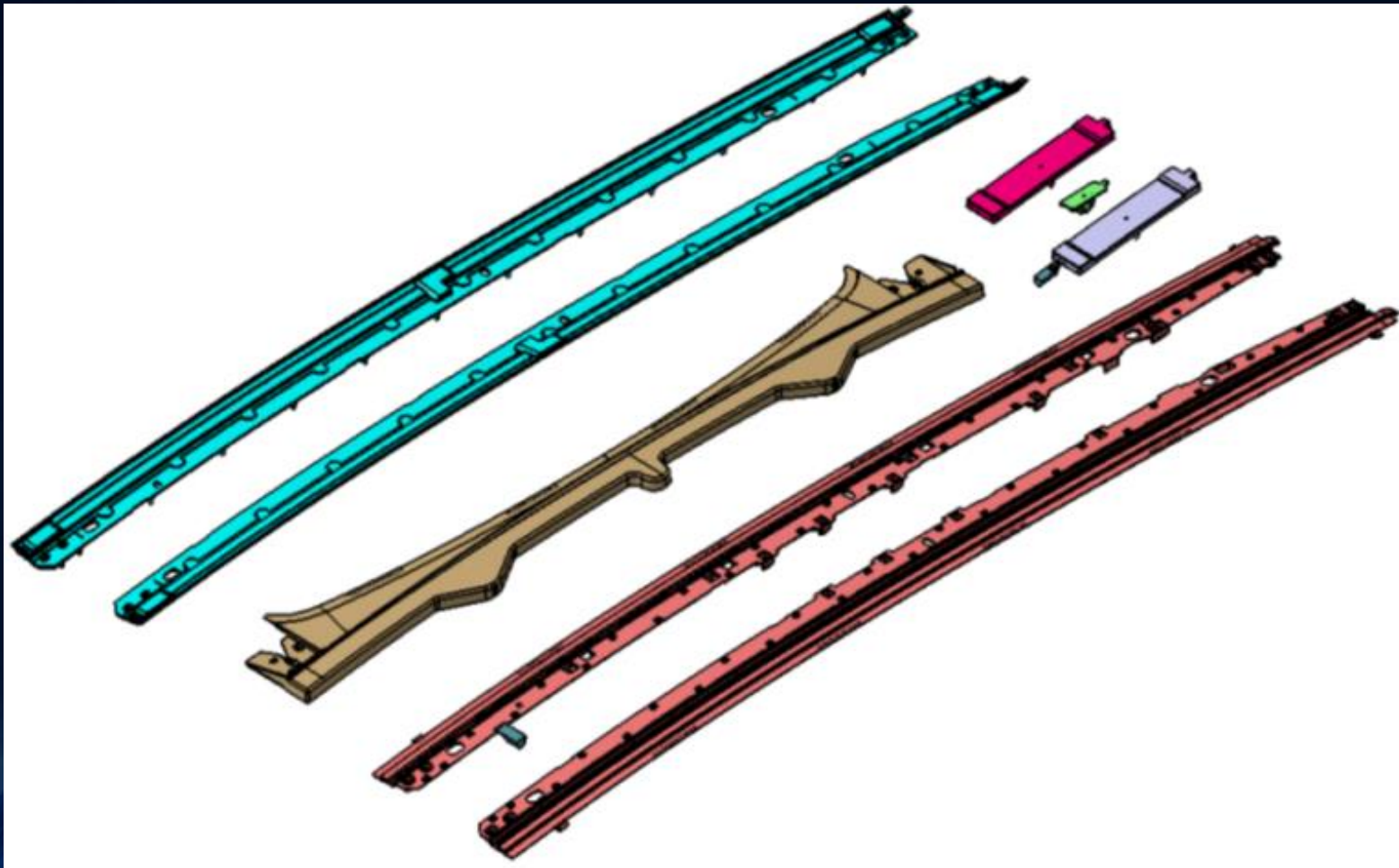
Aluminium Rail

## XIRAN® Rail



# Layout of 8 XIRAN® SMA-GF Parts in 1 Tool

(Adjustable Tool for Standard Scenic & Grand Scenic)



# Comparison of Rail Manufacturing Steps

## ALUMINUM BENCHMARK 7 STEP PROCESS

1. Extrude Profile
2. Cut Profile to Length
3. Fold via Stamping & Punching
4. Shape Curves
5. Machine / Mill Complex Shapes
6. Anodize Rail
7. Assemble Electrical Cable Clips,  
Spiral Cable Clips, Pins & Nuts

## XIRAN<sup>®</sup>SMA-GF 2 STEP PROCESS

1. Injection Mold Top & Bottom of  
Each Rail
2. Weld Upper & Lower Halves on  
Each Side

# First Commercial Application

- XIRAN® Rails Passed All Renault Validation Tests
- Renault Selected 2016 Renault Scenic for 1<sup>st</sup> Commercial Fixed Glass Roof with Roller-Blind Composite Rails
- Standard Scenic Rails = 1,169 mm
- Long Grand Scenic Rails = 1,239 mm

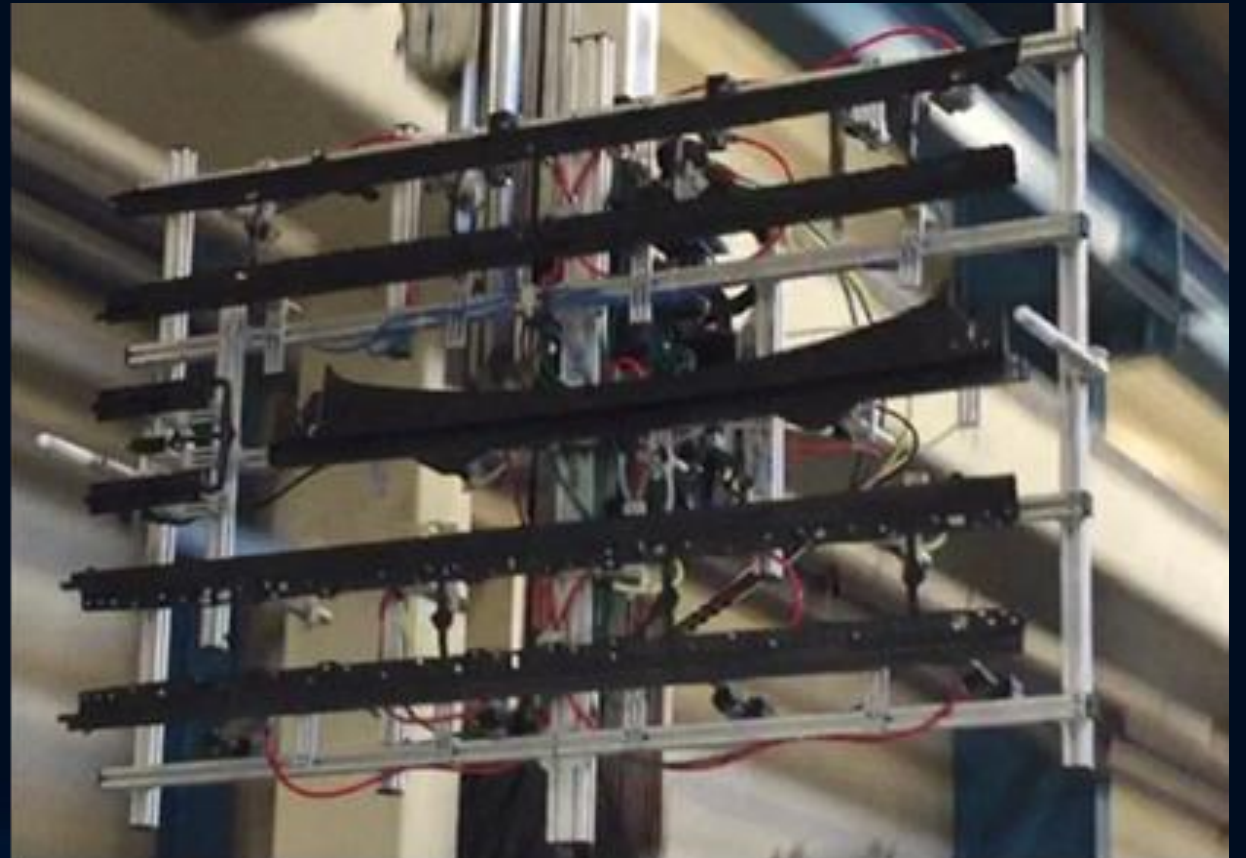
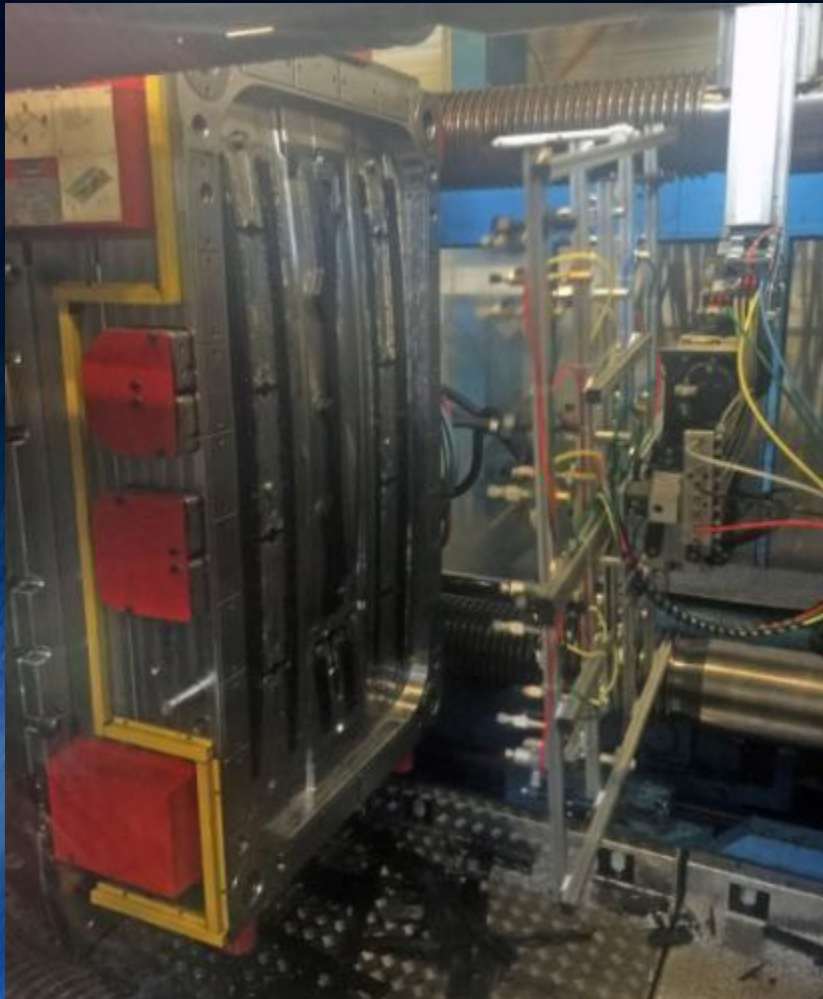




# 8 XIRAN® Parts in a “Family” Tool

## Robotic Extraction of Parts

(visible on ARRK-Shapers JEC Booth)





Assembled Thermoplastic  
Composite Frame

Prior to Attaching to  
Module

No Metal Components



# Final Functional & Aesthetic Inspection of Full Roller-Blind Module



# Fully Tested Module Ready to be Assembled

(visible on JEC Planet)





# Full Roof Module Top-loaded and Glued on Scenic BIW at Renault plant, in One Step



# Renault Grand Scenic Fixed-Transparent-Module





# Results & Conclusions

- Molder Benefits

- Flexible Tooling Design / 8 XIRAN® Parts Molded Simultaneously
- Quick Change between *Standard* and *Long* Rails

- Tier 1 Benefits

- Significant Reduction of Assembly Steps
- High Functional Integration
- No Rail Corrosion – No Need to Paint or Anodize
- No Rail Lubricant

# Results & Conclusions

- OEM Benefits
  - Plug-in Roof Installed in only 1 Step
  - Supply Chain Savings
  - Total System Cost Reduction
- Consumer Benefits
  - 13-mm More Headspace for Passengers
  - Much Larger View Through the Glass Panel (Daylight Opening)
  - Softer Roller-Blind Noise



# Thank You for Your Attention

