Aluminum

Aluminum is one of the most important materials in FRC. Different aluminum series have very different strengths, machining behavior, and real-world use in robot components.

6061-T6 Aluminum

6061-T6 is the most common **structural extrusion material** in FRC.

Properties:

- High strength and stiffness
- Excellent machinability
- Holds tapped threads well
- Good balance of weight and durability

Typical use:

- Structural extrusion (1x1, 2x1, 2x2)
- Drivetrain frames
- Tapped mounting points

5052 Aluminum

5052 is most commonly used as **sheet metal stock** in FRC.

Properties:

- Very ductile (bends without cracking)
- Not ideal for tapped holes
- Good fatigue resistance in sheet form
- Easier to form than 6061

Typical use:

- Custom plates and gussets
- Sponsor-cut sheet parts
- Bent or formed panels

7000 Series Aluminum (e.g., 7075)

7000 series aluminum is a **high-strength aerospace-grade material** that is significantly stronger than 6061.

Properties:

- Very high strength-to-weight ratio
- Stronger than 6061-T6
- Lower corrosion resistance unless treated
- More expensive and more sensitive to machining conditions

Typical use:

- High-performance custom components
- Lightweight but high-load structural parts
- Specialized drivetrain or mechanism elements

7000 Series in COTS FRC Components (WCP and Similar Vendors)

In FRC, 7000 series aluminum (commonly 7075) is often used in **COTS (Commercial Off-The-Shelf) components**, especially from vendors like West Coast Products.

Instead of teams machining it themselves, it is typically found in:

- High-strength drivetrain components
- Sprockets, hubs, and adapters
- Gearbox plates and structural side plates
- Shaft interfaces and high-load rotating assemblies

Why vendors use it:

- Allows lighter parts without sacrificing strength
- Handles repeated high torque loads better than 6061
- Improves durability in high-performance mechanisms
- Enables thinner, more compact designs while maintaining strength

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6061 vs 5052 vs 7000 Series

- **5052 → flexible sheet metal, easy forming**
- **6061 → standard structural extrusion, balanced performance**
- **7000 series → high-performance COTS and custom components with maximum strength**

Key Idea

Most FRC robots are built from 6061 extrusion and 5052 sheet, but 7000 series aluminum appears frequently in COTS components from vendors like West Coast Products because it enables stronger, lighter, and more compact high-performance parts.

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