

# Plan A: The Kit Build

## CVHS Motorized Drift Trike Project

Crescent Valley High School — Small Engines + Fabrication

Students: Colton Hankey & Atticus | Instructor: Mr. McAteer | Spring 2026

**Buy the BMI Karts complete axle kit. Focus your energy on the frame, CNC work, and making this trike look incredible.**

Estimated additional cost: \$460–\$520 | Fastest path to a rolling chassis | Lowest fabrication risk

### What this plan is about

Plan A sources the entire rear drivetrain as a pre-engineered kit from BMI Karts. The axle, hubs, bearings, sprocket, clutch, tires, and wheels all arrive designed to work together. Your time and skill go into the engine build, frame fabrication, CNC plasma branding, and making this trike a showpiece that demonstrates CVHS's shop capabilities.

## What You Already Have

Item	Status
Predator 212cc Non-Hemi engine (model 69730) with Stage 1 mods	In shop
ARC 6695 billet flywheel + ARC 6254 billet rod	Purchased
1.25" sq tube 0.095" wall — 50 linear ft (structural)	Ordered — Ram Steelco, Salem (will call)
1.25" sq tube 0.063" wall — 48 linear ft (secondary)	Ordered — Ram Steelco, Salem (will call)
Donor steel bicycle frame (26" wheel)	Located — students pick up
Full metals lab: CNC plasma, knee mills, lathes, MIG welders	Available

## What You Need to Buy

#	Item	Source	Est. Cost
1	<b>BMI Karts Drift Trike Axle Kit w/ Tires, Rims &amp; Clutch (#35, 40" axle)</b> <i>Includes: 1" x 40" live axle, 3x aluminum hubs, bearing hangers, 56T sprocket, #35 chain + master link, 12T centrifugal clutch (3/4" bore), 2x Unilli 10.5x4.50-6 racing slicks, 2x 6" aluminum wheels, keystock, lock collars</i>	bmkarts.com	\$300–350
2	PVC pipe — 6" Schedule 40 (~4 ft) for drift sleeves	Home Depot	\$20
3	Mechanical disc brake kit for drift trike / go-kart (1" axle)	Amazon	\$30–40
4	7/8" twist throttle kit with cable + kill switch	Amazon	\$15–20
5	Tether / deadman kill switch (magnetic or clip type)	Amazon	\$10–15
6	Go-kart seat — low-profile aluminum bucket	Amazon / GPS	\$30–40
7	Grade 5/8 bolt assortment (various sizes)	Hardware store	\$20
8	1/4" flat plate for gussets, brackets, CNC work (~12"×24")	Ram Steelco / scrap	\$15
9	Spray primer + paint (school colors)	Hardware store	\$20
<b>PLAN A TOTAL (additional purchases)</b>			<b>\$460–520</b>

### ✓ ADVANTAGES

Everything fits together — proven, purpose-built kit  
Fastest path to a rolling chassis  
Centrifugal clutch included — simple, reliable  
More time for frame fabrication and CNC branding  
Lowest risk of rework or fitment issues

### ✗ TRADEOFFS

Most expensive option (~\$100–170 more than Plan C)  
Less machining experience (no hub adapter project)  
Less "we built every part" showcase factor  
Students don't design the axle system from first principles

# Phase 1 — Engine Build

## SMALL ENGINES CLASS

Installing billet flywheel + billet rod, governor removal

**Safety: Why Billet Matters Even for a Slow Trike** Once the governor is removed, nothing limits RPM except the throttle. The stock cast flywheel can shatter above ~5,500 RPM — that's an explosion of metal shrapnel. The ARC 6695 billet flywheel is machined from a solid forged aluminum block and rated to 10,000+ RPM. The ARC 6254 billet rod prevents connecting rod failure. These are *safety parts*, not performance parts. We're installing them even though we plan to cruise at 3,000–4,500 RPM.

## What You're Installing

Part	Part Number	Purpose
Billet aluminum flywheel	ARC 6695 (Non-Hemi specific)	Replaces cast flywheel — safe to 10,000+ RPM
Billet connecting rod	ARC 6254	Replaces cast rod — aircraft-grade aluminum, ARP bolts
Side cover gasket	From kit	Required when opening the crankcase
Spark plug	Autolite 3910X	Proper heat range

## What You're NOT Installing

The performance cam and heavy valve springs from the kit stay in the box. Stock cam and springs are fine for a slow drift trike. Less to go wrong.

## Procedure Summary

1. Drain oil, remove external components (air filter, exhaust, shroud, recoil starter)
2. Remove ignition coil (note air gap), then remove stock flywheel with puller
3. Remove side cover — access the governor and connecting rod
4. **Remove governor** gear, shaft, and arm. Plug shaft hole. Clean ALL debris from crankcase.
5. **Install ARC 6254 billet rod** — oil bearing surfaces, torque rod bolts to kit spec. *Second person verifies torque.*
6. Reassemble side cover with new gasket (star pattern, 8–10 ft-lbs)
7. **Install ARC 6695 billet flywheel** — align key, torque nut to 60–65 ft-lbs. *Second person verifies torque.*
8. Set ignition coil air gap: 0.010"–0.014" (business card method or feeler gauge)
9. Reinstall everything, fill fresh 10W-30 oil, install new spark plug

10. Pull through by hand — verify no binding

See the full step-by-step Engine Build Procedure document for the detailed version with torque specs and verification log.

#### WATCH BEFORE YOU START

**YouTube: "Predator 212 Non-Hemi Governor Removal + Billet Flywheel"** — Search for videos by **Red Beards Garage** and similar channels. Watch the full governor removal process before touching the engine.

**Go Kart Nerds: Step-by-Step Governor Removal Guide** — Written walkthrough with photos.

**Go Kart Nerds: Complete Predator 212 Performance Mod Guide** — Understand all the stages so you know where your build sits.

**OMB Warehouse: Official Governor Removal Instructions** — The kit manufacturer's own guide.

#### STUDENT DOCUMENTATION REQUIRED

**Before engine work:** Photograph the engine from 4 angles (baseline reference).

**During:** Photo of governor removed + clean crankcase, photo of billet rod installed, photo of billet flywheel installed.

**After:** Complete the two-person verification log with torque values and signatures.

**Deliverable:** Completed verification log sheet, signed by both students and Mr. McAteer.

## Phase 2 — Frame Fabrication

METALS / FABRICATION CLASS

Design, cut, weld, inspect

### Key Dimensions

Parameter	Target	Why
Wheelbase	52–56"	Long enough for stability, short enough for responsive drifting
Rear track width	30–34"	Wide = stable, prevents tipping during slides
Seat height	10–14" from ground	Low center of gravity for drifting
Ground clearance	3–4" minimum	Clears paved surfaces without scraping
Front wheel	26" bicycle wheel	From donor frame — provides steering and grip
Rear wheels	10.5" go-kart wheels with PVC sleeves	From BMI kit — PVC provides low-friction drift surface

### Material Usage

Material	Color Code	Use For
0.095" wall (50 ft available)	RED mark	Main frame rails, rear axle cross-members, engine mount, bicycle junction, gussets
0.063" wall (48 ft available)	BLUE mark	Cross-braces, seat frame, foot pegs, chain guard frame, cosmetic panels

#### Color-code your tubes BEFORE cutting.

Mark the end of every 0.095" tube with a red paint marker and every 0.063" tube with blue. This prevents accidentally using thin-wall tube in a structural location. One wrong tube in the wrong spot could mean a frame failure.

### Build Sequence

- 1. Prepare donor bicycle:** Cut behind seat tube. Keep: head tube, fork, front wheel, handlebars, front brake. Remove everything else.

2. **Design and cut list:** Sketch the frame (3 views). Map ALL cuts onto stock lengths before cutting anything. Two people verify each measurement.
3. **Cut all tubes:** Band saw or chop saw. Deburr every cut. Label every piece.
4. **Weld rear frame on flat table:** Tack → check square (diagonals must match within 1/8") → full weld. Use 0.095" for main rails and cross-members.
5. **Join bicycle front to rear frame:** This is the highest-stress joint. Align front wheel centered and vertical. Tack → verify → weld → ADD GUSSETS (CNC plasma cut from 1/4" plate).
6. **Engine mount sub-frame:** Match Predator 212 bolt pattern. Crankshaft height must align with axle sprocket height.
7. **Axle bearing mount plates:** CNC plasma cut from 1/4" plate, face on mill. Slot holes for chain tension adjustment.
8. **Secondary structure:** Seat frame, foot pegs, chain guard frame (0.063" tube).
9. **Weld inspection:** Mr. McAteer inspects all structural welds before anything is mounted.
10. **Finish:** Grind, clean, prime, paint in school colors.

 **WATCH BEFORE YOU WELD**

[YouTube: "Drift Trike Frame Build Welding"](#) — Watch several builds to see different approaches to the bicycle-to-frame junction.

[YouTube: Cut Weld Build — Drift Trike Series](#) — Time-lapse style build showing the full fabrication process.

[Instructables: Complete Drift Trike Build Guide \(16 steps with photos\)](#) — Detailed written + photo walkthrough of a similar bicycle-front-end drift trike build.

[YouTube: "MIG Welding Thin Wall Square Tube"](#) — Critical technique reference. Your 0.063" tube WILL burn through if your settings are too hot.

 **STUDENT DOCUMENTATION REQUIRED**

**Before cutting:** Dimensioned 3-view sketch (top, side, rear). Cut list mapped onto stock lengths.

**During:** Photo of each major weld joint. Diagonal measurement log (to prove frame is square).

**After:** Completed measurement log with actual vs. design values. Photos of finished frame before paint.

**Deliverable:** Design sketch, cut list, measurement log, weld inspection sign-off from Mr. McAteer.

## CNC Plasma Opportunities (Plan A Highlight)

Since Plan A saves time on drivetrain fabrication, invest that time into CNC work that makes the trike a showpiece:

- **CVHS nameplate / logo** — CNC plasma cut from 1/8" or 3/16" steel plate, weld to rear frame
- **"Small Engines + Fabrication" text plate** for side panels

- **Gusset plates** with school logo or decorative perforation patterns
- **Engine mount plate** — CNC plasma cut to exact Predator 212 bolt pattern
- **Brake caliper mounting bracket** — precision-cut for exact alignment
- **Decorative side panels** — perforated patterns that let you see the tube frame underneath

## Phase 3 — Drivetrain Assembly

**Plan A: Kit Assembly** Unbox, assemble, align

### BMI Karts Kit Assembly Sequence

1. Mount pillow block bearing hangers to frame (bolts, not welded)
2. Slide components onto the 1" keyed axle in order: lock collar → hub → wheel → lock collar → sprocket hub → lock collar → hub → wheel → lock collar
3. Thread axle through both bearings
4. Spin axle by hand — must rotate freely with zero binding
5. Install centrifugal clutch on engine crankshaft (3/4" bore, keyway + set screw + bolt)
6. Install #35 chain between clutch sprocket (12T) and axle sprocket (56T)
7. Set chain tension: 1/2"—3/4" deflection at mid-span
8. Verify chain alignment: sight down from drive sprocket to driven — must be straight
9. Install chain guard (fabricate from flat stock)
10. Install PVC drift sleeves over rear tires (deflate tire → slide PVC on → reinflate)

#### WATCH BEFORE ASSEMBLY

**YouTube: "BMI Karts Drift Trike Axle Assembly"** — REV J's build series (linked from BMI's website) shows exactly how to mount the kit.

**BMI Karts: REV J Drift Trike Build Series** — Official BMI page with links to the full video series. Video #6 specifically covers tire/rim mounting.

**YouTube: "Centrifugal Clutch Install Predator 212"** — Clutch-to-engine mounting and sprocket alignment.

**YouTube: "Drift Trike PVC Sleeves Install"** — How to fit PVC pipe over go-kart tires for the drift surface.

**SpiderCarts: Go-Kart Rear Axle Setup Guide** — Excellent written guide on live axle fundamentals.

#### STUDENT DOCUMENTATION REQUIRED

**During assembly:** Photograph the axle assembly before sliding into bearings. Measure and record chain tension.

**After:** Verify axle spins freely (video clip is ideal). Verify chain alignment with a straight-edge.

**Deliverable:** Photos of completed drivetrain from both sides. Chain tension measurement.

## Phase 4 — Brakes, Controls & Safety Systems

NON-NEGOTIABLE — ALL ITEMS REQUIRED

### Controls Setup

Control	Location	Source
7/8" twist throttle	Right handgrip	Amazon kit (~\$15–20)
Front brake lever	Left hand	From donor bicycle
Rear brake lever	Right hand or foot pedal	With brake kit or bicycle lever
Kill switch button	Left handlebar	With throttle kit or separate (~\$5)
Tether / deadman switch	Clip to rider's wrist, mount on frame	Amazon (~\$10–15)

### Safety Checklist — Must Be Verified Before ANY Riding

- Kill switch (handlebar): start engine → press switch → engine dies instantly
- Tether (deadman): start engine → pull tether → engine dies instantly
- Throttle return: twist open → release → snaps closed on its own
- Front brake: squeeze lever → front wheel locked, cannot spin
- Rear brake: activate → rear wheels locked, cannot spin
- Chain guard: fully covers chain run, no exposed links
- All bolts checked with torque wrench (engine, axle, bearings, wheels, seat)
- Oil level checked on dipstick
- Fuel system: no leaks at tank, line, or carburetor
- No loose wires, cables, or clothing-snag hazards

**The tether kill switch is the single most important safety feature.** If the rider falls off, the cord pulls out and grounds the ignition coil — engine dies instantly. Without it, a riderless trike keeps going. This is mandatory for a school environment. Budget \$10–15 and install it before the first engine test.



**YouTube: "Go Kart Kill Switch + Tether Wiring"** — How to wire both the handlebar kill switch and tether in parallel to ground the ignition coil.

**YouTube: "Twist Throttle Install Predator 212"** — Routing the cable, setting up the return spring, connecting to the carburetor.

## Safety Gates — Hard Stops

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The project does not advance past a gate until Mr. McAteer signs off. No exceptions.

Gate	Must Be Complete	Sign-Off
<b>0 — Design Review</b>	Dimensioned sketch (3 views), cut list mapped onto stock, parts ordered with confirmation numbers	<input type="checkbox"/> Mr. McAteer
<b>1 — Engine Build</b>	Governor removed, crankcase clean. Billet rod torqued + verified by 2 people. Billet flywheel torqued + verified by 2 people. Oil filled. Photo documentation complete.	<input type="checkbox"/> Mr. McAteer
<b>2 — Engine Running</b>	Engine starts and idles. No leaks after 5 min. Kill switch tested. Throttle return tested. Break-in complete (30 min). Oil changed post-break-in.	<input type="checkbox"/> Mr. McAteer
<b>3 — Frame Complete</b>	All welds inspected (no porosity, cracks, undercut). Frame flat + square (diagonals within 1/8"). Gussets at bicycle junction. Painted/primed.	<input type="checkbox"/> Mr. McAteer
<b>4 — Drivetrain</b>	Axle spins freely. Wheels secure. Clutch installed. Chain tension correct. Chain alignment verified. Chain guard installed. Engine mounted (all 4 bolts).	<input type="checkbox"/> Mr. McAteer
<b>5 — Safety Systems</b>	Front + rear brakes tested. Kill switch tested on complete trike. Tether tested. Throttle return tested. ALL bolts torque-checked. PPE ready. Fire extinguisher staged.	<input type="checkbox"/> Mr. McAteer

### First Ride Protocol (After Gate 5)

1. Walking speed only — idle and roll, no throttle
2. Test brakes at walking speed
3. Test kill switch while rolling
4. Test tether while rolling (walk alongside, step away)
5. If everything works: slow laps, 5–10 MPH, no drifting
6. After 10 clean minutes: gentle drift attempts
- 7. Never ride alone. Mr. McAteer present + fire extinguisher staged at all times.**

## Timeline

Week	Phase	Key Activity	Gate
1–2	Design	Sketch, dimension, cut list, order parts	Gate 0 ✓
2–3	Engine	Billet install, governor removal, bench test, break-in	Gate 1 ✓ Gate 2 ✓
3–5	Frame	Cut, weld, inspect, CNC gussets + nameplate, paint	Gate 3 ✓
5–6	Drivetrain	BMI kit assembly, chain, clutch	Gate 4 ✓
6–7	Integration	Brakes, throttle, kill switch, tether, final assembly	Gate 5 ✓
7–8	Testing	First ride protocol, tuning, refinement	—
8–9	Finish	CVHS branding, documentation, presentation	—

## Documentation & Deliverables Summary

Deliverable	When	Format
3-view dimensioned design sketch	Gate 0	Hand-drawn or CAD
Cut list mapped onto stock	Gate 0	Written table
Engine verification log (torques, signatures)	Gate 1	Printed form, signed
Photo log of entire build	Ongoing	Phone photos, organized by phase
Frame measurement log (diagonals, spacing)	Gate 3	Printed form
Pre-ride safety checklist (signed)	Gate 5 + every ride	Printed form, signed
Gear ratio calculation	Phase 3	Written, show work
"Lessons Learned" write-up	Week 8–9	1 page, typed or written
Final presentation	Week 9	To class or school

## Reference Links

### VENDORS

[BMI Karts — Drift Trike Axle Kits](#)

[GoPowerSports — Engine Parts, Torque Converters, Sprockets](#)

[OMB Warehouse — Governor Removal Kits, Bearings, Axles](#)

[Amazon — Clutch, Brake Kit, Throttle Kit, Tether, Wheels](#)

 **TUTORIALS & GUIDES**

[Go Kart Nerds: Complete Predator 212 Mod Guide](#)

[Go Kart Nerds: Governor Removal Step-by-Step](#)

[OMB Warehouse: Governor Removal Official Instructions](#)

[Instructables: Drift Trike Build — 16 Steps with Photos](#)

[BMI Karts: REV J Build Series \(Video Links\)](#)

[SpiderCarts: Live Axle Setup Fundamentals](#)

[DIY Go Karts: Rear Drive System Plans](#)

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Crescent Valley High School — Small Engines + Fabrication Collaboration

Plan A: The Kit Build — February 2026

Prepared for Colton Hankey & Atticus by Mr. McAtee