

CamPathWeaver 3D Official Manual

~ Cinematic 3D Camera Flight from a Single Stroke & 3-Point Corner Turn Lookahead Engine ~

This document serves as the official manual for "**CamPathWeaver 3D: Flight Path**" (Ver 1.00), a professional 3D camera trajectory generator and keyframe baking engine in the Weaver Pipeline Series, designed for Moho Pro 14 or later (Compatible with Moho 12.5 / 13.5 / 14+).

Note: While thoroughly tested and verified in Windows environments, its internal architecture (Lua scripts and native Moho matrix/transform APIs) operates identically on macOS.

Part 1: What is CamPathWeaver 3D? (Philosophy & Innovation)

1.1 The Pitfalls of Conventional 3D Camerawork: Why Manual Keyframing Breaks Down

While Moho is primarily renowned as a 2D vector animation powerhouse, its native Z-depth, 3D layer positioning, and true 3D camera system offer extraordinary spatial staging capabilities.

However, when animators attempt to stage dynamic **3D camera flythroughs**—such as first-person character POV, sweeping drone flights, or dynamic tracking shots—they inevitably encounter severe workflow bottlenecks:

1. Spatial Disorientation & Unnatural Drift:

- Manually setting keyframes across Moho's camera tools (Track, Pan/Tilt, Zoom, Roll) frequently misaligns the camera's translation vector with its optical heading, causing disorienting lateral skidding and floaty drifts.

2. Jerky Snapping at Corners:

- Simple linear or bezier interpolation between trajectory waypoints causes the camera to snap abruptly at corners or look off in bizarre directions right before turns, completely failing to replicate natural human head anticipation or steady-cam lookahead rotation.

3. The "Retake Nightmare":

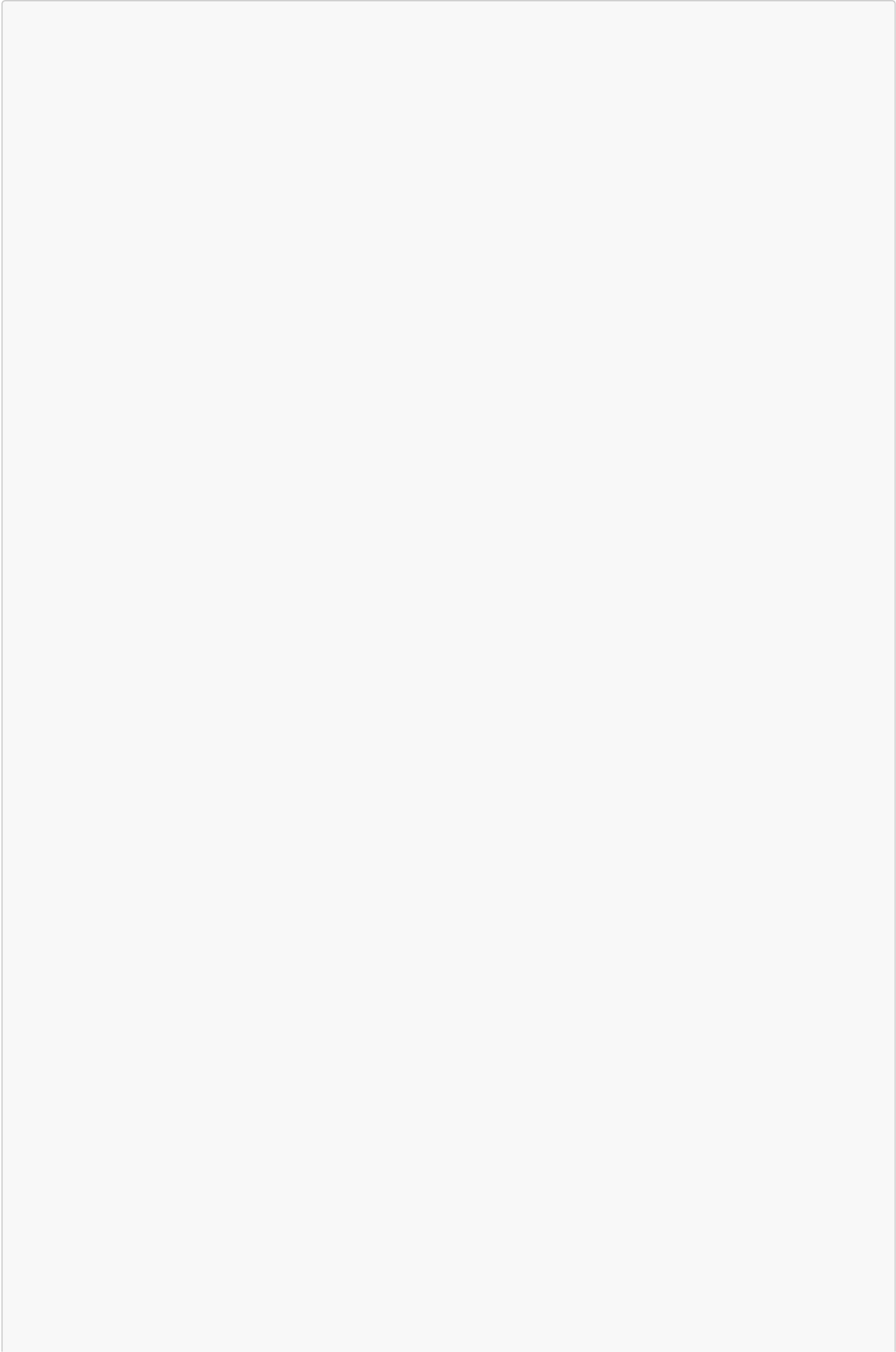
- Making even minor compositional revisions—such as elevating the flight altitude slightly or delaying arrival at a corner by 15 frames—forces animators to manually nudge and recalculate dozens of keyframes across 4 to 5 separate timeline channels (Track X/Y/Z, Pan, Tilt, Zoom).
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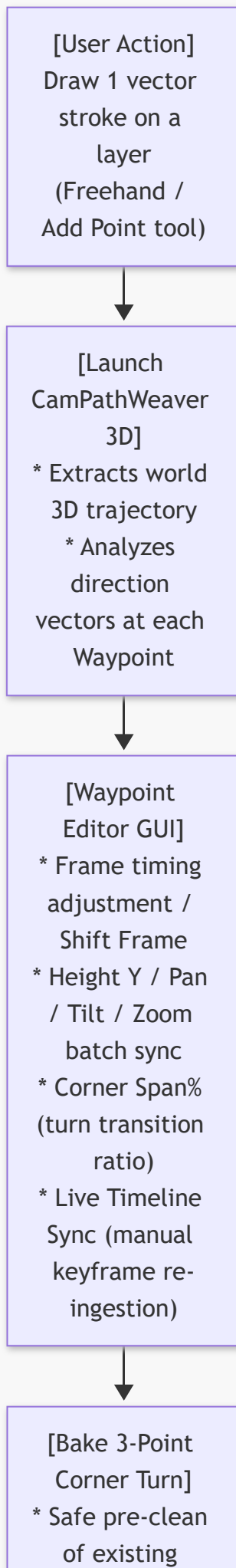
1.2 The Breakthrough: The "Stroke-to-Camera" Paradigm

"**CamPathWeaver 3D**" introduces a fundamental paradigm shift by treating **vector strokes (2D or 3D lines)** as the literal physical flight path of the camera.

Animators simply draw a **single continuous stroke** across the floor plane or through 3D space using Moho's familiar Freehand or Add Point tool.

CamPathWeaver analyzes the vertices, computes spatial compound matrices, calculates heading angles at each corner, allocates timeline frames, and **bakes clean native 3D camera keyframes directly into Moho in milliseconds.**





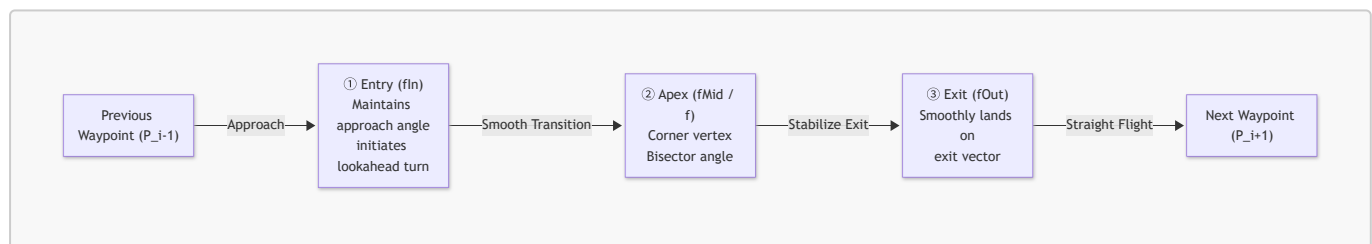
camera
keyframes
* Generates
complete Entry
/ Apex / Exit
transitions
* 1-Click bake
to Track /
PanTilt / Zoom
/ Roll

1.3 Core Engineering: 3-Point Corner Turn (Realistic Head Pan/Tilt)

When a human cinematographer or drone navigates a bend, the camera does not snap rigidly upon reaching the vertex.

Instead, the camera begins anticipating the turn ahead of the corner (**Entry**), reaches maximum angular velocity at the apex (**Apex**), and smoothly stabilizes onto the new straightaway (**Exit**).

CamPathWeaver embodies this physics model through its proprietary **3-Point Corner Turn Algorithm**:



- **Entry Frame (f_{in})**: At $(1 - \text{Span}\%)$ before the corner, camera starts rotating its sightline while maintaining its approach heading.
- **Apex Frame (f_{mid})**: Directly at the waypoint vertex, the camera aligns with the exact angular bisector of the entry and exit vectors.
- **Exit Frame (f_{out})**: At $\text{Span}\%$ after the corner, the camera cleanly completes rotation and locks onto the forward flight path.

This three-point transition completely eliminates abrupt camera snaps, visual stutter, and motion sickness.

Part 2: Installation and Setup

2.1 File Placement

CamPathWeaver 3D is a menu-driven Lua script. Place the script file into Moho's custom content folder:

```
[Moho Custom Content Folder]
└─ scripts/
```

```
└─ menu/
  └─ we_campathweaver_menu.lua <-- Place here
```

Reloading:

If Moho is already open, reload scripts instantly by pressing **Ctrl + Alt + Shift + L** (Windows) / **Cmd + Opt + Shift + L** (macOS), or restart Moho.

2.2 Menu Location

Access the tool from Moho's top menu bar under:

[Scripts] → [Weaver] → [CamPathWeaver 3D: Flight Path]

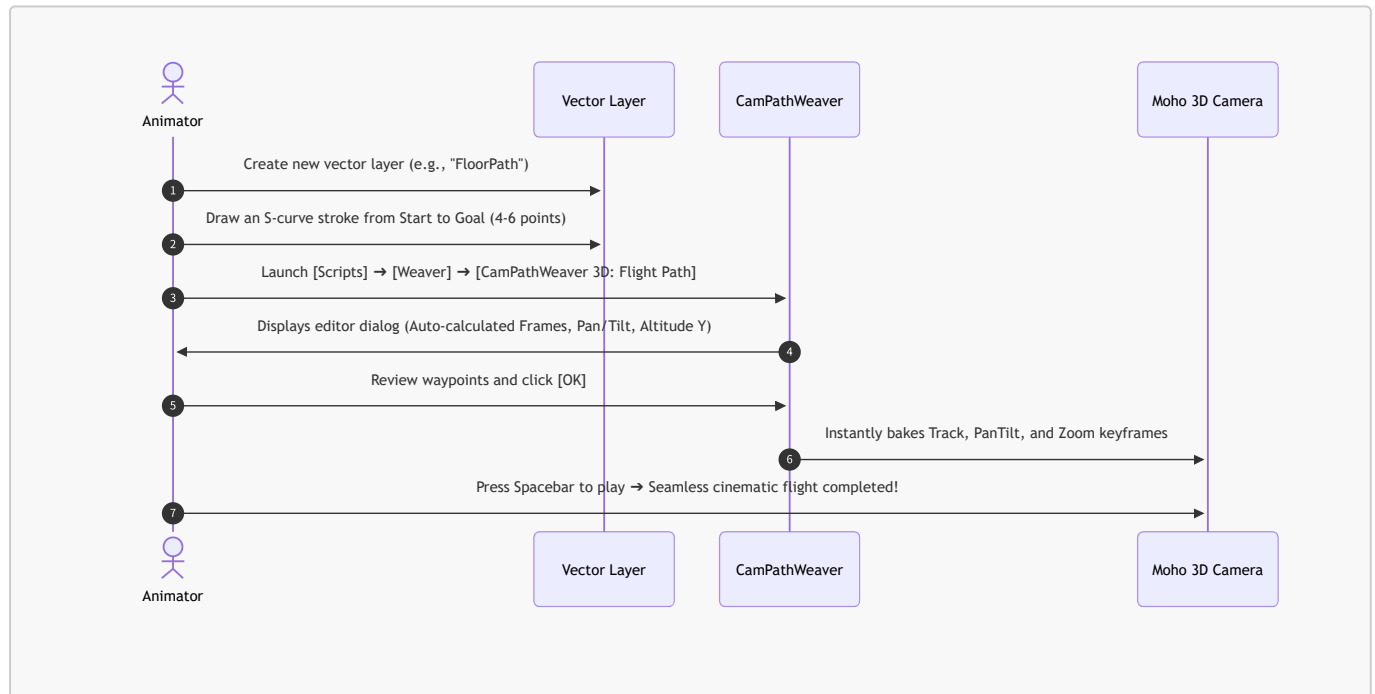
2.3 Recommended Keyboard Shortcut

For rapid iterative staging, assigning a keyboard shortcut is strongly advised:

- **Recommended Key:** **Ctrl + Shift + C** (Windows) / **Cmd + Shift + C** (macOS) (*C for Camera / CamPath*)
- Set via: **[Edit] → [Preferences] → [Keyboard Shortcuts] → Search CamPathWeaver.**

Part 3: Quick Start Guide (Your First Flight in 3 Minutes)

Here is the quickest workflow for creating a smooth S-curve flythrough over a floor plan:



Step-by-Step Instructions:

1. Draw the Path:

- Create a standard vector layer. In top-down view (or on a perspective floor layer), draw the desired camera route as a single continuous stroke from start to finish.

2. Launch CamPathWeaver:

- With the path layer selected, run **[CamPathWeaver 3D: Flight Path]** (or press **Ctrl + Shift + C**).

3. Review Waypoints in Dialog:

- Each stroke vertex is automatically loaded into the table as **P1 (Start)**, **P2 (Turn)**, **P3 (Turn)**, and **P4 (Goal)**.
- Timeline frames are automatically distributed evenly across your project length.

4. Bake Keyframes:

- Click **[OK]**. Moho's native camera channels (**Track**, **PanTilt**, **Zoom**, **Roll**) are populated with baked keyframes. The path layer is automatically renamed to **CamPath_[LayerName]**.

Part 4: Editor UI & Parameter Reference

The GUI dialog is meticulously engineered for granular control and immediate feedback:

```
+-----+
+-----+
| CamPathWeaver 3D: Flight Path Editor
|
+-----+
+-----+
| Layer: 'CamPath_Floor' | Points: 30 | Base Height (Y): 0.00 | [Span: Loaded (30
pts)]
|
+-----+
+-----+
| [Select All] [Clear] | Shift Frame: [ 10 ] [Shift]
|
+-----+
+-----+
| [< Prev Page] | Page 1 / 2 (Points 1 - 15 of 30)
| [Next Page >] |
+-----+
+-----+
| [x] Waypoint | Frame | Y | Pan | Tilt | Zoom | Span
|
| [x] P1 (Start) | [ 1 ] | [ 0.00 ] | [ -45.0 ] | [ 0.0 ] | [ 2.00 ] | [ -- ]
|
| [x] P2 (Turn ) | [ 25 ] | [ 0.50 ] | [ 12.3 ] | [ -5.0 ] | [ 2.00 ] | [ 25 ]
|
| [x] P3 (Turn ) | [ 50 ] | [ 1.20 ] | [ 78.9 ] | [ -10.0 ] | [ 1.80 ] | [ 30 ]
|
| ...
|
| [x] P15 (Turn ) | [116 ] | [-0.50 ] | [ -6.4 ] | [ 0.0 ] | [ 2.00 ] | [ 25 ]
|
+-----+
+-----+
| [x] Smooth 3-Point Corner Turn (Realistic Head Pan/Tilt)
|
|
| [Cancel] [OK] |
```

```
+-----+
|-----+
+-----+
```

4.1 Top Status Header & Toolbar

- **Layer & Metadata Status:** Displays active layer name, point count, base layer elevation, and cache restore state ([**Span:** Loaded (N pts)]).
- **[Select All] / [Clear]:** Toggles row checkboxes for batch syncing or frame shifting across the currently visible page.
- **Shift Frame:** Enter an offset (e.g., +15 or -10) and click **[Shift]** to shift timeline arrival frames across all checked waypoints in the currently visible page.
- **[< Prev Page] / [Next Page >] (Pagination):**
 - Automatically splits waypoints into 15-point pages when the flight stroke contains more than 15 points, preventing UI overflow.
 - Navigate pages to inspect and edit every waypoint.
 - **Critical Safety Design:** Checkbox selection and batch sync operations (▼ Y, ▼ Pan, Shift, etc.) are **strictly scoped to the currently active page**, ensuring edits on one page never inadvertently alter points on other pages.

4.2 Waypoint Table Columns

Column	Control	Description
Check [x]	Checkbox	Designates target rows for batch syncing and frame shifts.
Waypoint	Label	Indicates waypoint role: P1 (Start), P2.. (Turn), or Pn (Goal).
Frame	Integer	The timeline frame number when the camera passes this waypoint.
▼ Y	Float & Sync Button	World altitude (Y coordinate). Clicking ▼ copies row 1's height downward to all checked rows.
▼ Pan	Float & Sync Button	Horizontal heading angle (-180° to +180°). Initial values auto-derived from stroke geometry.
▼ Tilt	Float & Sync Button	Vertical pitch angle (-90° lookdown to +90° lookup). 0° represents a level horizon.
▼ Zoom	Float & Sync Button	Camera focal scale (Moho default is 2.00). Lower values widen the field of view; higher values zoom in.
▼ Span	Integer & Sync Button	Corner transition span ratio (1% to 50%). Determines the percentage of transition time allocated to anticipatory head-turn. (<i>Start and Goal points are not corners and show --</i>).

4.3 Smooth 3-Point Corner Turn Checkbox

- **Checked (Default / Recommended):** Generates complete Entry → Apex → Exit transitions for natural, fluid lookahead rotation.
- **Unchecked:** Places keyframes strictly at the waypoint frames (f). Useful for robotic or intentional low-fi linear staging.

Part 5: Professional Staging Techniques

5.1 Technique 1: 3D Elevation & Dynamic Tilt from a Flat Floor Path

Even when drawing strokes on a flat 2D floor plane, CamPathWeaver can elevate shots into three-dimensional cinematic experiences:

1. Crane-Up / Rising Aerial Reveal:

- Set P1 (Start) with height $Y = 0.00$, $Tilt = 0.0^\circ$.
- Progressively increase Y up to 1.50 at P4 (Goal), while setting $Tilt = -20.0^\circ$ (downward pitch).
- The camera glides along the ground and then rises gracefully into the air, revealing the full city layout below.

2. High-Speed Dive Shot:

- Start high with $Y = 3.00$ and $Tilt = -45.0^\circ$ at P1.
- Drop sharply to $Y = 0.20$ and level off $Tilt = 0.0^\circ$ at P2 to simulate a swooping bird or drone skim.

5.2 Technique 2: Shaping Vehicle Dynamics with Span%

• Span = 15% (Sharp, Snappy Drifts):

- Camera remains locked facing forward until the absolute last moment before rapidly whipping through the turn. Perfect for sports cars, jet fighters, or mecha action.

• Span = 40% - 50% (Sweeping Grand Curves):

- Camera begins easing its gaze toward the upcoming exit far in advance. Ideal for airliners, cruise ships, or contemplative walking tours.

5.3 Technique 3: Live Timeline Sync (Bidirectional Hybrid Workflow)

CamPathWeaver is never a one-way street:

1. Bake the camera path from the script dialog.
2. Play back in Moho's viewport. If you decide frame 30 needs a tighter zoom and a slight upward tilt, **simply tweak the camera keyframe directly on Moho's native timeline.**
3. Relaunch **[CamPathWeaver 3D: Flight Path]**.
4. **Live Timeline Sync automatically detects your timeline adjustments and reads the updated Zoom, Tilt, Pan, and Height values back into the editor!**

```
[CamPathWeaver] Synced P3 from timeline keyframe (F=30): Pan=45.0, Tilt=15.0, Zoom=2.80, Y=0.80
```

5. Re-bake without losing any manual refinements.

5.4 Technique 4: Non-Destructive Safe Keyframe Cleanup

Repeatedly re-baking camera paths can leave orphaned entry/exit keyframes scattered across the timeline, causing camera jitter.

CamPathWeaver automatically performs a **clean pre-wipe of all camera channels (Track, PanTilt, Roll, Zoom) across the active flight frame range** before writing new keyframes. Your timeline remains pristine no matter how many retakes you perform.

Part 6: Synergy with the Weaver Pipeline Series

- **With FoldWeaver 3D (50s / 54s):**
 - FoldWeaver constructs papercraft 3D rooms, cities, and architectural props out of 2D drawing layers.
 - Drawing a CamPathWeaver flight stroke along FoldWeaver streets creates immersive flythroughs through 2D animated sets with stunning spatial depth.
- **With ObjWeaver 3D (70s):**
 - ObjWeaver imports 3D OBJ models and reconstructs them into 2.5D cel-shaded vector rigs.
 - Draw a circular path around an imported 3D mech or prop, point the camera toward the center, and produce flawless **360° cinematic orbital shots** in seconds.
- **With ShadowBaker 3D (60s):**
 - When skimming the floor, baked contact shadows and multi-layered perspective shading react dynamically to camera altitude and lighting direction.

Part 7: Troubleshooting & FAQ

Q1. Alert: "Please select a Vector Layer with a flight stroke."

- **Cause:** An invalid layer (Bone layer, Image layer, empty Group layer) is active, or nothing is selected.
- **Fix:** Select the vector layer containing your drawn flight path before launching the tool.

Q2. Alert: "The vector layer must contain at least 2 points for a flight path."

- **Cause:** The selected layer contains fewer than 2 points.
- **Fix:** A camera flight requires at least a start point and an end point. Draw a stroke with at least 2 connected points.

Q3. The camera flies backwards along the curve.

- **Cause:** The stroke was drawn in the reverse direction.
- **Fix:** CamPathWeaver treats the first point drawn as P1 (Start) and the final point as Pn (Goal). Draw from start to destination, or adjust Pan heading values in the dialog.

Q4. Are Span% and waypoint customizations saved if I close the dialog?

- **A. Yes, 100% saved via Dual Redundant Storage.**
Settings are persisted in the layer's internal **UserComments** metadata and backed up in Moho's runtime memory session cache (**sessionCache**). When the dialog header reads **[Span: Loaded (N pts)]**, your settings have been restored completely.

Product Specifications & Licensing

- **Product Name:** CamPathWeaver 3D: Flight Path (Weaver Pipeline Series)
- **Script Identifier:** `we_campathweaver_menu.lua`
- **Version:** Ver 1.00
- **Developer:** Sentaku Clip
- **Official Support:** info@sentakuclip.net
- **Copyright:** Copyright (C) 2026 Sentaku Clip. All Rights Reserved.