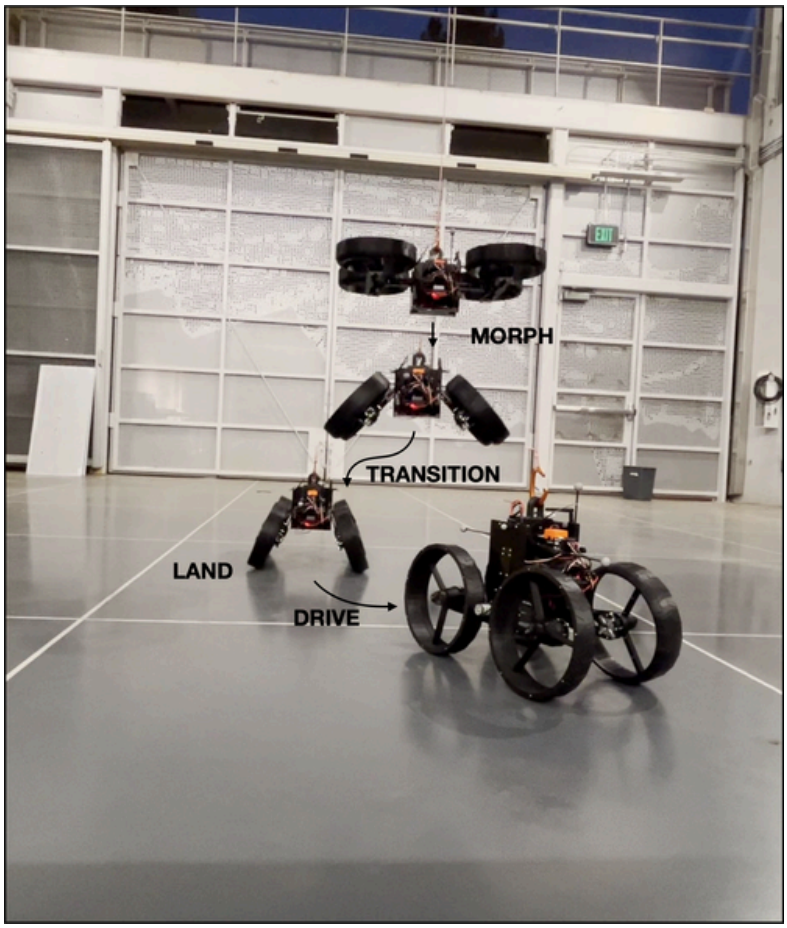
What is the Problem?

Archeologists have an issue; they have places in this world that are impossible to reach by humans in our current state, whether it be at the bottom of a 400-foot drop-off in a cave, in the middle of one of history's largest protected battle sites, or even in an active warzone. We can fix that with ATMO and M4, two remotely controlled vehicles that are able to transform between car and drone freely.

ATMO Introduction



As it becomes increasingly difficult to locate and preserve archeological sites in areas that are challenging to access or protect, a more effective approach to finding and preserving these structures is to utilize tools like CalTech’s ATMO.

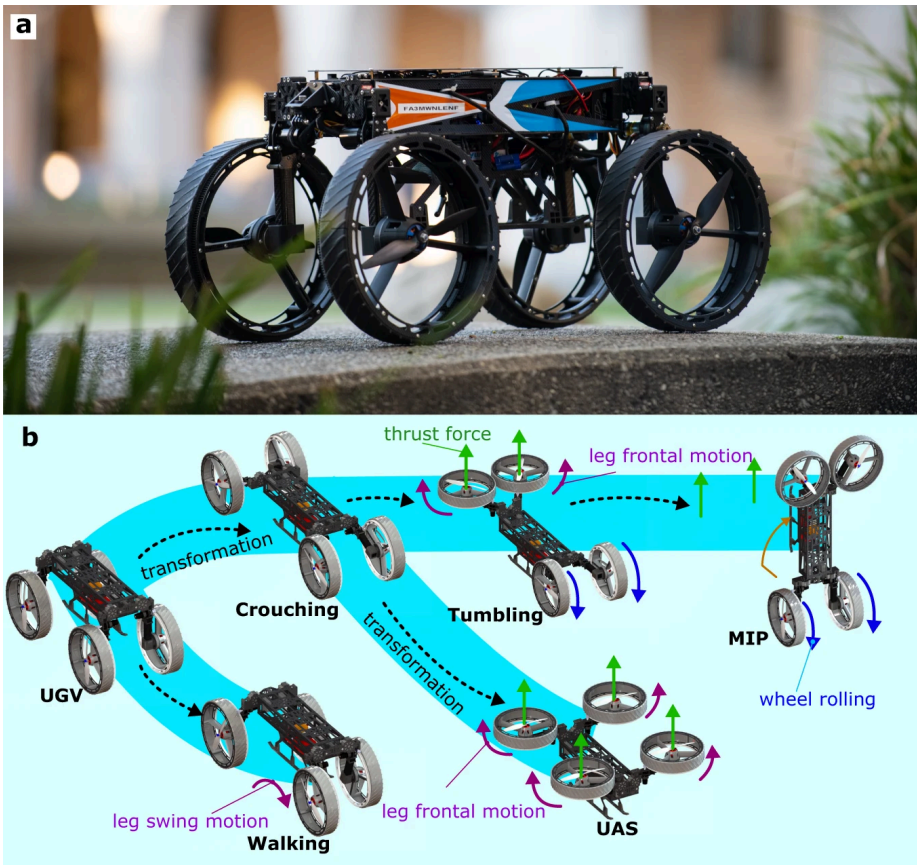
ATMO works by having a drone turn into a car by folding down its wings into wheels. As ATMO turns into a car, two motors switch directions so they can move forward. CalTech's design helps because it can fly into a hard-to-reach area and turn into an RC car-like state to be able to roll into the proposed dig site and start surveying the area.

What type of RC Drone is ATMO?

An RC Drone like ATMO is like a normal drone, but when it lands, it turns into an RC car, so you can drive it around on the ground without a problem. This is helpful because it can maneuver on the ground and in the air, which means we can go on more terrain.

The ATMO (aerially transforming morphobot), developed by Caltech, is a versatile robot that can transition between flying drone and wheeled rover configurations, performing its transformation mid-air.

M4

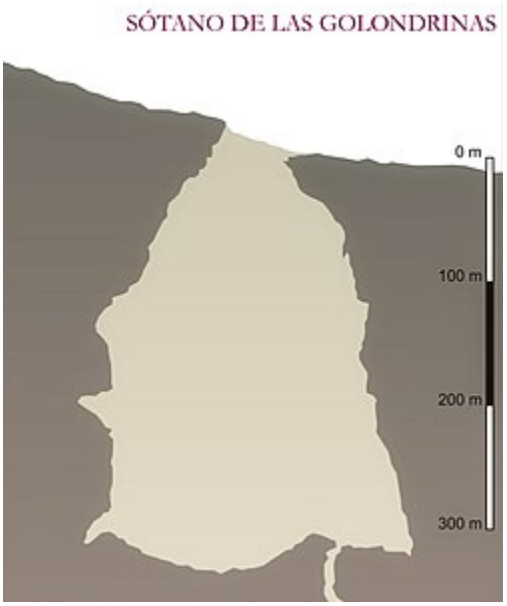


M4 was also made by Caltech, although earlier. It can fly, roll, crawl, crouch, balance, tumble, scout, and loco-manipulate. It can move on a slope of upwards of 45 degrees. Landslides and floods could affect its movement, so it can transform into its environment.

Fig 2.[2]

What's our thought?

Our thought is a mix of the two. A Drone that, when it reaches the proposed dig site, turns into an RC Car and traverses the area. An example is the Cave of Swallows in San Luis Potostí, Mexico. The cave's depth is 515 m (1,690 ft) (As shown in Fig. 3), and if you imagine a



piece of an ancient civilisation, there might be an issue getting humans safely to the ground. The RC vehicle would start as a drone, then slowly lower into the ground and turn into a car, and inspect the area, looking for the item of interest, and if equipped with a camera, it can capture its findings and also be a control point for operators of the vehicle. Then, it will rise up out of the area and go into the area where operators are working and get the footage into a hard drive or optical media for preservation and second opinions from other Archaeologists.

As the drone flies, its movement will be tracked and could be automatic or manually controlled by a human operator at any moment.

Fig 3

Who did we reach out to?

We reached out to the Gharib Research Group, but they have not yet responded as of January 20th, 2026, 4:07 pm. They made ATMO and M4. We have not gotten a response from them, but are hoping for one in the future.

Sources

1) Gharib. “Gharib Research Group.” *Gharib Research Group*, 2020, https://www.gharib.caltech.edu/roboticflightgallery/aerially-transforming-morphobot-atmo. Accessed 6 Jan. 2026.

2) Sihite, Eric, et al. “Multi-Modal Mobility Morphobot (M4) with Appendage Repurposing for Locomotion Plasticity Enhancement.” *Nature Communications*, vol. 14, no. 1, 27 June 2023, p. 3323, www.nature.com/articles/s41467-023-39018-y, https://doi.org/10.1038/s41467-023-39018-y. Accessed 8 Jan. 2026

3) “Cave of Swallows.” Wikipedia, 17 Feb. 2022, en.wikipedia.org/wiki/Cave_of_Swallows. Accessed 8 Jan. 2026

4) Coxworth, Ben. “Flying robot morphs mid-air to land and roll on wheels.” *New Atlas*, 29 May 2025, https://newatlas.com/robotics/atmo-flying-wheeled-morphing-robot/. Accessed 15 January 2026.

5) GitHub Repository: https://github.com/mandralis/ATMO

A resource we never used

https://www.nature.com/articles/s44172-025-00413-6.epdf?sharing_token=6Tu2g5khQTJo9z6iH_vKUdRgN0jAjWel9jnR3ZoTv0O_DGh6T1lO1tULMfO3vNRbGtWxJKTqdXU657h95dd07_m7UN7HiSsaVuVVKG5fT-v-tcZnwIoyc61l0BqgSpPvGGdYL7gNL7uwu1wyA4zZ76XAYgUmYX8d2zBAXU7izwI%3D