DIVING

Requirements for successful elite diving:

- appropriate angular momentum
- appropriate changes in body configuration in the air

**Generation of angular momentum**

For a backward ("reverse") somersault:

\[ \text{force} \times \text{torque} \]

For a forward somersault:

\[ \text{force} \times \text{torque} \]
Actions in the air

- small moment of inertia $\rightarrow$ large angular velocity
- large moment of inertia $\rightarrow$ small angular velocity
Angular momentum is a vector:

- If angular momentum vector points away from you, you see clockwise rotation.
- If angular momentum vector points toward you, you see counterclockwise rotation.
- If angular momentum vector points neither toward nor away from you, you see no rotation.
Combined twisting and somersaulting

Let’s see a motion that starts as a pure backward somersault.

Then the diver lowers the right arm ...

“the” plane = plane perpendicular to the angular momentum vector

The longitudinal axis of the diver is now off the plane:
We now have a somersault rotation and a twist rotation.

Effect of $H_{SOM}$: double-conical somersault

Effect of $H_{TW}$: twist rotation

View along longitudinal axis: twist angular momentum vector points away from us, so we see clockwise rotation
To stop the twist rotation: Need to get longitudinal axis back into the plane.

One option:

Get back into the plane after a whole number of twist rotations (1.0, or 2.0, or 3.0 twist rotations):

Problem: In a backward somersault it is difficult to judge the time of entry into the water. This makes it impossible to make last-instant corrections → excessive splash.
It would be advantageous to get back into the plane after 1.5, 2.5 or 3.5 twists (instead of 1.0, 2.0 or 3.0). That way the somersault rotation would be a forward somersault ("face-first").

This requires a readjustment of the arms right after producing the tilt:

![Diagram showing readjustment of arms](image)

right arm sneaks back up; left arm sneaks down

Then get back into the plane after a number of twists-and-a-half (1.5, or 2.5, or 3.5 twist rotations):

![Diagram showing somersaulting and twisting](image)

after 1.5 (or 2.5 or 3.5) twists

somersaulting + twisting

pure somersaulting ... face-first!