

WING IN GROUND CRAFT

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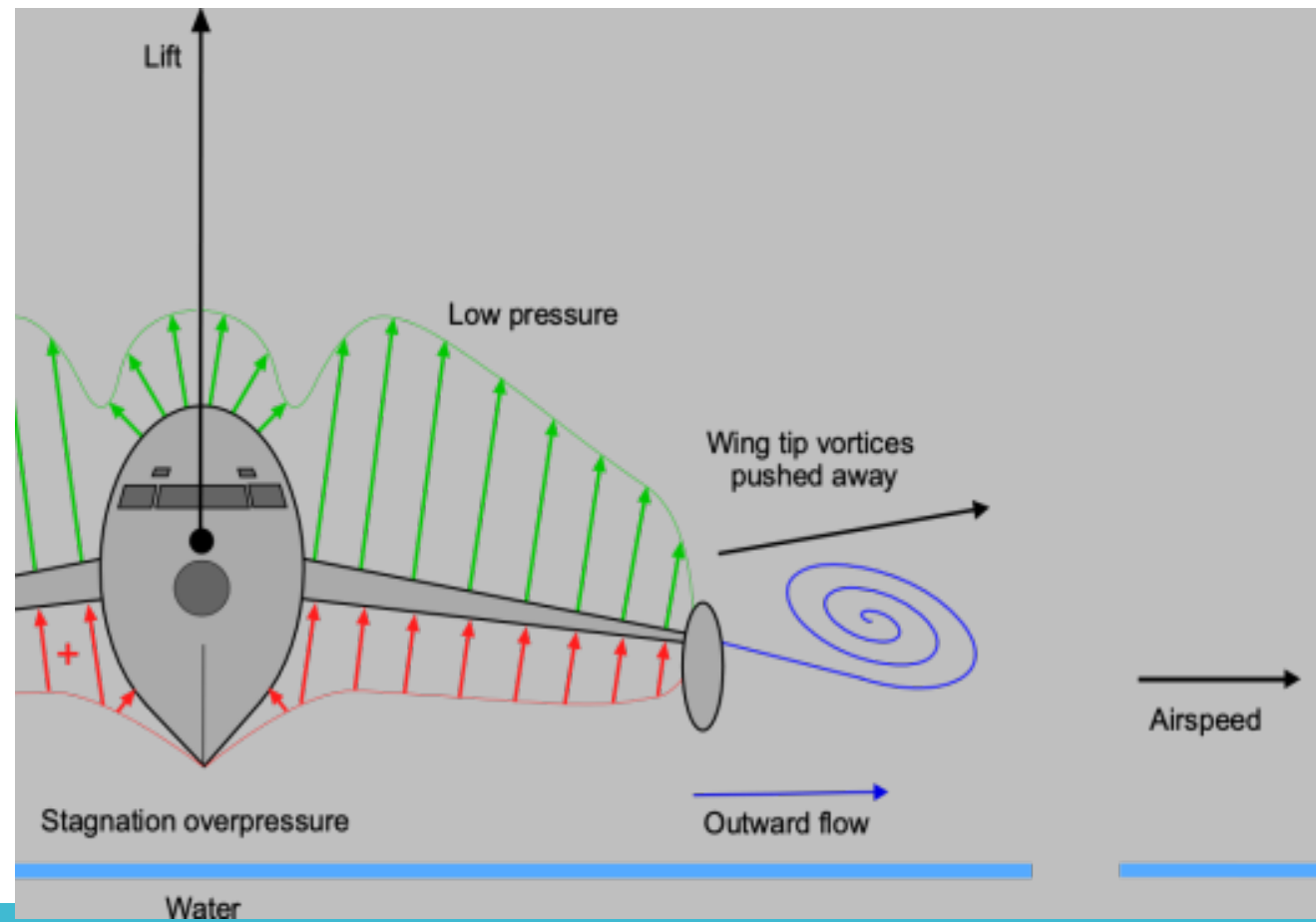
United States Merchant Marine Academy

Is it a plane or is it a boat?

Ground Effect Craft, aka Wing in Ground Effect craft are considered as a sea going vessel by the USCG and the IMO.

Although they operate over the surface of the water, they rely primarily on the water for takeoff and landing, and are safest when navigated over water for their transit.





How do they work?

Theory behind Ground Effect

In essence, the ground effect generates a rise in the lift-over-drag ratio when a three-dimensional wing approaches a flat plane either over land or water or land. These crafts rely upon extended flat surface areas to maintain the ground effect

In a WIG craft, this effect is accomplished as part of the design. This is accomplished through an alteration in the form of the air movement around the wing, also known as downwash. By altering the direction of the downwash, an increase in lift and a decrease in drag is achieved.

Benefits of the Ground Effect

Proponents of this technology state that Ground Effect craft have greater carrying capacity than a plane of equivalent size.

GEVs can travel faster than a traditional ship, even faster than most High-Speed Craft.

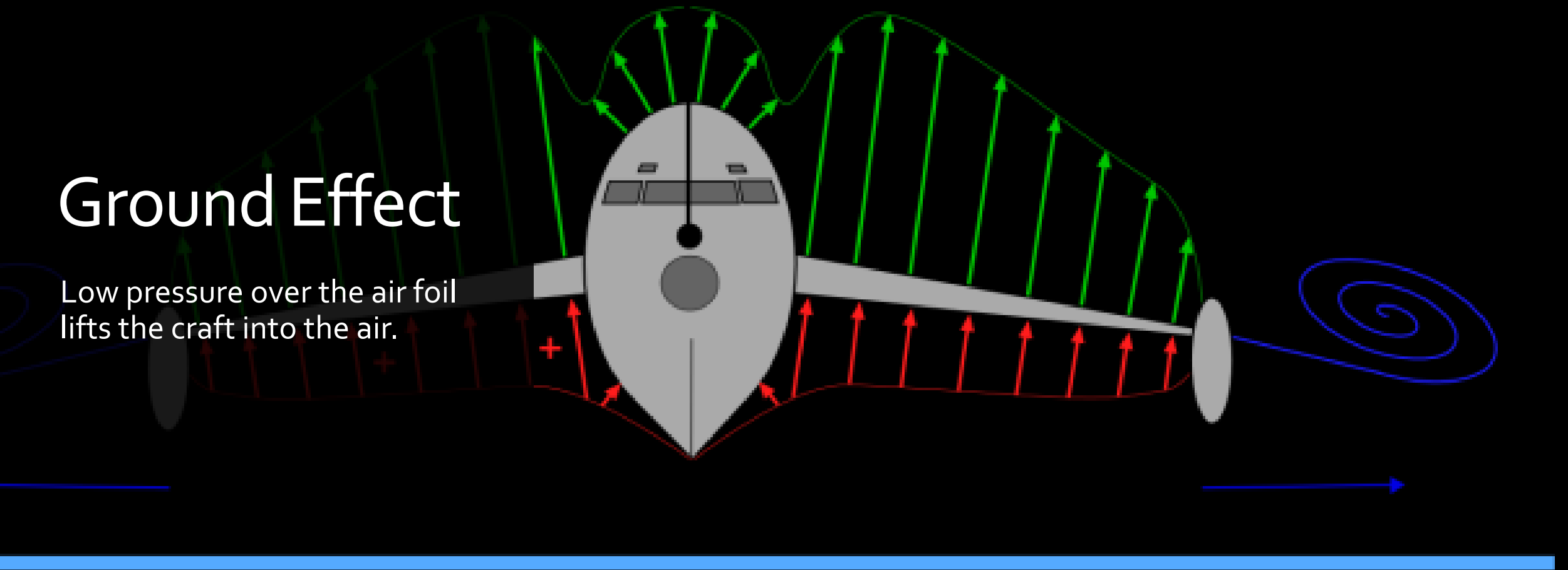
Drawbacks of the Ground Effect Craft

GEVs rely upon a flat surface below them for the ground effect to work. Therefore, current design relies upon either flat planes (as in places like Mongolia) or flying over the water.

Since waterborne WIGs takeoff and land on water, sea states no greater than 3 are desirable to maintain a margin of safety.

Ground Effect

Low pressure over the air foil lifts the craft into the air.



Resurgence of an old technology

- WIG craft are not new to the market.
- The effect was discovered during the early era of flight.
- The Soviets attempted to harness this technology. The *Caspian Sea Monster* is a notable example.
- Due to the collapse of the Soviet economy there were no further developments in the field for quite some time.

The Caspian Sea Monster



Military Application

- There has been interest in the study and development of WIG craft in recent years.
- The US Defense Advanced Research Projects Agency has openly solicited industry for designs in relation to Ground Effect Vehicles.
- The Islamic Revolutionary Guard Corps Navy of Iran has purchased a number of WIG craft calling them the *Bavar-2*.
- The Polish Military University of Technology has been designing an unmanned ekranoplan.

Military Application

- Due to the manner in which GEVs operate they are capable of carrying larger payloads than an equivalent sized plane.
- They flow at low enough altitudes to be able to “fly under the radar” but also above the surface of the water to avoid any potential mines.

Iranian Bavar-2



Civilian Application

- While the military has expressed interest in WIG craft, there is a growing interest in the civilian arena.
- WIG craft show promise in the high-speed ferry market, with considerable interest being shown in the Mediterranean as demonstrated by REGENT's orderbook.

Training

- To date, the United States does not have a model training or training concept in use for captains and crew.
- The International Maritime Organization considers WIG to be High-Speed and fall under licensing guidelines attributed to merchant mariner credential.
- Both organizations have published guidelines that couple the WIG craft with High-Speed Craft credentialing.

Why WIG? Why Now?

- The question remains, if this technology has been around for decades, what gives with the sudden interest?
- New technology has spawned interest
- REGENT craft has designed an all-electric craft to meet environmental sustainability standards over and above the rest, ensuring their craft are quiet enough for even the most secretive military application.
- The Flying Ship Company is garnering interest with their autonomous craft.
- Potential has been seen in the fields of Search and Rescue as well as Passenger and Cargo transportation either autonomous or crewed.

CONCLUSION

- Old Concept coupled with newer technology is paving the way for the resurgence in interest and the potential benefit of Ground Effect implementation.
- Interest is worldwide enough that countries such as the USA and Singapore have laws on the books regarding WIG craft.
- There is a potential for both the military and civilian markets

Questions?

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