

WAMASC Newsletter

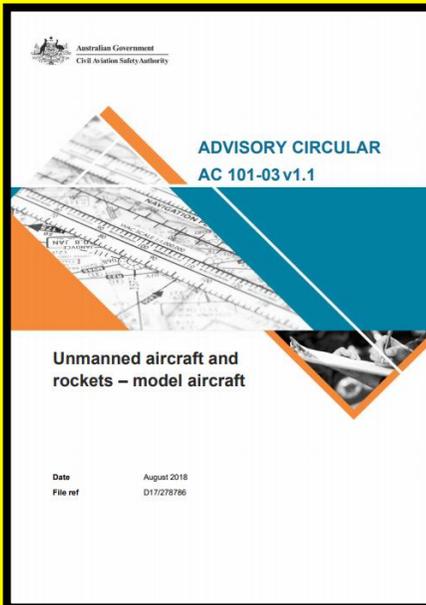


January 2021

Ground Effect



CASA Advisory Circular



Happy New Year 2021



should any individual have anything at all they would like to contribute, share, or add to this newsletter, please feel free to contact the [editor](#) through the [Club Secretary](#) via ✉ secretary@wamasc.com.au – enjoy

Ground Effect

Is it a bird; or is it a plane? Or, as the Monty Python team would say – “and now for something completely different”.

The ‘**ekranoplan**’ is a mix between a **ship** and a **plane** that functions using **ground effect**.

A ground-effect vehicle (**GEV**), also called a wing-in-ground-effect (**WIG**), ground-effect craft, wingship, flarecraft or more often referred to in Russian as an **ekranoplan** (this is probably because of the “Caspian Sea Monster”).

In short, a ground-effect vehicle is a vehicle that is able to move over a surface by gaining support from the reactions of the air against the surface of the earth or water beneath it.

So, what am I talking about; and what is this strange phenomenon I speak of? In relation to a **fixed-wing aircraft**, **ground effect** is caused by **aerodynamic drag** that is generated by an **aircraft's wing**(s) when it is close to a **fixed surface**. That surface is normally the ground, but it can be any object in close proximity below the wing as it compresses and influences the vortices between the two (another aircraft in the air for example). It is also worth noting that ground effect can also be generated by the empennages horizontal stabiliser as well as, and in conjunction, with the main wing – this will include any wide lift body.

We have all experienced ground effect when landing an aircraft – ground effect is that invisible force that can cause that aircraft to ‘float’ and suddenly want to leap back into the air. A pilot can often, on approach for landing – fly just above the runway while the aircraft accelerates in ground effect until a safe **climb speed** is reached.

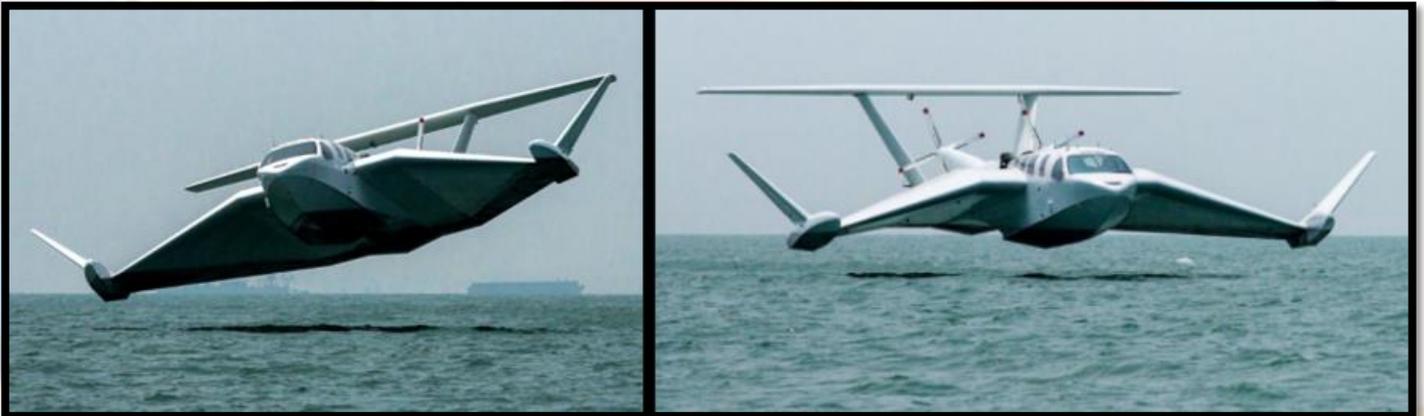
For **rotary-wing aircraft**, **ground effect** results in more power being available during hovering which allows heavier weights to be lifted. Helicopter pilots are provided with performance charts which show the

limitations in both ground effect and normal flight envelopes – that is for hovering their helicopter **in ground effect** (IGE) and **out of ground effect** (OGE). The charts show the added lift benefit produced by ground effect (ambient conditions must also be considered).

For **fan, and jet-powered VTOL aircraft**, **ground effect** when hovering can cause a ‘suck down’ condition and fountain lift on the airframe and loss in hovering thrust if the engine sucks in its own exhaust gas (this simply means that an engine has re-ingested its already heated and expanded exhaust gas – not a good scenario as it creates an instant loss of lift). This is referred to as **hot gas ingestion** (HGI) – an affliction the Harrier new well. So, one could ask the question – is there a use and place for ‘**ground effect**’? It has, in fact, been toyed with in many experimental craft for many years as it is nothing new.

Basically, you wind up with a craft, or vehicle that flies and operates at height of between one to fifteen metres altitude dependant on the crafts scale, mass, and size. Most of these vehicles are water-based creatures due to the ease of using a liquid surface for take-off. Floatation ability and the lack of any requirement for landing gear is a bonus and once airborne they float on a compressed cushion of air for an exceptionally smooth ride.

Pictured below is the experimental **AirFish 8** ground effect Vehicle from **Widgetworks**, a **Singaporean** based company. This modern-day vehicle is composed of composite material and is being looked at for use as a high-speed passenger ferry service. Widgetworks has resurrected a post WWII German design to commercialize a beautiful reverse-delta ground effect vehicle for high-speed, high-efficiency cartage of six to eight passengers.



The AirFish 8 hovers serenely between two and 23 ft (0.6 to 7 m) over the water and is capable of speeds in excess of 120 mph (193 km/h) but remains restricted. This latest incarnation of the **German Lippisch design** has the vehicle at 56.4 ft (17.2 m) in length, with a reverse delta wingspan of 49.2 ft (15 m) and a carbon fibre reinforced plastic body to reduce weight. It is powered by a 500-hp (373-kW) V8 car engine, running on regular unleaded fuel and propelled by two mid-mounted pusher props in front of a large T-tail.

Seating six to eight passengers plus baggage and two crew, it is so simple to operate and fly that pilots can gain certification in less time than for a regular pilot's license. Range is presently around 345 Nautical miles (555 km).

Now if you think that's cool the Russian's had a similar idea during the Cold War years. They where actually looking at getting across the water quickly and depositing troops on an alternate shore should the need arise. To do so they came up with the **KM** (**Korabl Maket**) (Russian: Корабль-макет, literally meaning ‘**Ship-prototype**’).

The KM was referred too and known colloquially as the **Caspian Sea Monster** (something I eluded too at the beginning of this article); an experimental ground effect (ekranoplan) vehicle developed by the **Soviet Union** in 1960 by the **Central Hydrofoil Design Bureau**.

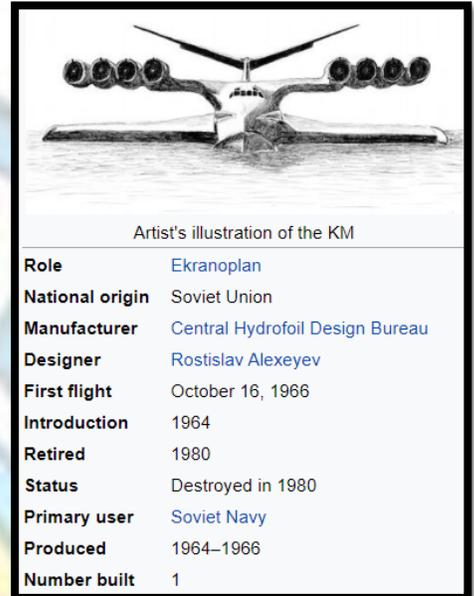
The **KM** began operation in 1966 and was continuously tested by the Soviet Navy until 1980, when it was damaged in a testing accident and sank in the Caspian Sea.

The KM was the largest and heaviest aircraft in the world from 1966 to 1988, and its surprise discovery by the United States and the subsequent attempts to determine its actual purpose became a distinctive and constant cause of espionage during the Cold War between the two nations.

The KM had a wingspan of 37.6 metres (123 ft); a length of 92 m (302 ft); a maximum take-off weight of **544 short tons** (494 t); and was designed to fly at an altitude of 5–10 metres (16–33 ft) using ground effect.

Notably the KM was also a stealth aircraft as it was undetectable to many radar systems of the time, flying below the minimum altitude of detection. Testing showed the KM to have an optimum (fuel efficient) cruising speed of 430 Km/H (267 mph, 232 knots), and a maximum operational speed of 500 Km/H (311 mph, 270 knots). The maximum speed achieved was 650 Km/H (404 mph, 350 knots), although some sources claim up to 740 Km/H (460 mph, 400 knots).

Despite technically being an **aircraft**, it was considered by the authorities to be closer to a **boat** and was assigned to the **Soviet Navy** but operated by **test pilots** of the **Soviet Air Forces**. The KM was documented as a marine vessel and prior to the first flight a bottle of champagne was broken against its nose, a tradition for the first voyage of any **watercraft**. The last of its breed to sail the waters of the Caspian, "Lun" was completely abandoned after the 1990s collapse of the Soviet Union.



Now the story of the KM did not end with its sinking in 1980. After lying dormant on the bottom of the sea floor for just over a year, the **Caspian Sea Monster**, one of the most eye-catching flying machines ever built, was raised, refloated, and berthed at the **Kaspiysk** Naval Base, some 100 kilometres (62 miles) up the coast from **Derbent** where it was condemned to rust away – forgotten by many and only viewed via spy satellites.

There she remained berthed for just a tad shy of forty years – that is until July 2020 where she has once again seen on the move.

The **Caspian Sea Monster** has been purchased and saved by an anonymous entrepreneur who has given her a makeover and had her made seaworthy enough for a very special journey.

Now entering the New Year in January 2021 that journey is now complete.

That journey took 14 hours of manoeuvring the monster via a flotilla of three tugs and two escort vessels slowly coercing her along the shores of the Caspian Sea to be delivered to her final destination.

A stretch of coast near Russia's southernmost point.

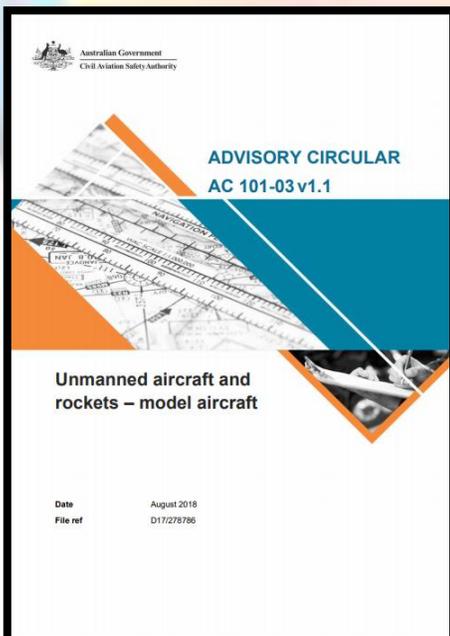
It is here that this very bulky special cargo has found her final resting place; a new **theme park**, next to the ancient city of **Derbent**, in Russia's republic of **Dagestan**.

The 380-ton "Lun-class Ekranoplan" has now found its new, and most likely definitive, home becoming a tourist attraction and one that I would like to visit at cessation of this COVID-19 pandemic.



The Caspian Sea Monster at Kaspiysk photographed with a KH-8 reconnaissance satellite

CASA Advisory Circular



Is it is not commonly known within our Aeromodelling fraternity that the **MAAA** (Model Aeronautical Association of Australia) and our State Body the **AWA** (Aeromodellers Western Australia) are both governed and dictated too by the **CASA** (Civil Aviation Safety Authority).

I make this point and statement to amplify an absolute fact that although we are governed by many Rules and Regulations (mostly found within MAAA MOP's, Local Club Rules, and By-Laws etc.) that anything CASA has in place, or has released, has and is the overruling authority.

Pictured adjacent left is **CASA Advisory Circular 101-03v1.1** which was updated and re-issued in August 2018.

<https://www.casa.gov.au/sites/default/files/unmanned-aircraft-rockets-model-aircraft-advisory-circular-101-03.pdf>

Said Advisory Circular deals with, and is pertinent too, model RC aircraft.

In particular Page 6, Paragraph 3 of the CASA Advisory Circular 101-03v1.1 gives a clear and concise **definition of a model aircraft**. It also covers the requirement for **inspection** post repair/re-build to an aircraft after sustaining

damage (whether a crash or other). Please be mindful of these requirements and remember that two sets of eyes are better than one. Many aircraft are making an appearance at the Field that are not strictly 'airworthy'.

Below are some extracts from said circular:

3.1.1 A model aircraft is any unmanned aircraft, other than a balloon, rocket, or kite, which is flown for sport or recreational purposes, weighing not more than 150 kg, excluding fuel but including equipment installed in or attached to the aircraft at the commencement of its flight.

3.1.2 A model aircraft flown for any other purpose is covered by the term 'remotely piloted aircraft' (RPA) and is subject to the rules applicable to RPA.

3.1.3 A model aircraft is excluded from the vast majority of the regulations applied to other aircraft. For example, there are no requirements for aircraft registration, pilot licensing or aircraft airworthiness certification; however, the regulations which DO apply are contained in sub-parts A-C and G of **Part 101**.

3.1.4 CASA has classified model aircraft by take-off weight (excluding fuel) as follows: a. less than 100 grams – exempt, subject only to the general rules for unmanned aircraft b. 100 grams to 25 kilograms – model aircraft c. more than 25 kilograms but not more than 150 kilograms – giant model aircraft.

3.1.5 A giant model aircraft can only be operated under the rules and procedures of an approved aviation administration organisation such as the **Model Aeronautical Association of Australia** (MAAA).

In Appendix A

A.1 General

- ❖ Always fly with regard to the general regulations concerning radio-controlled flying covered in Sections 5, 6 and 7.
- ❖ **Model aircraft should be thoroughly checked prior to each flying session and after any hard landing.**
- ❖ Metal propellers must not be used on internal combustion engines or electric motors.
- ❖ All radio-controlled models are subject to in-flight vibration, landing knocks, transport damage etc. Take care that receivers and batteries are well protected, servos are fixed securely, control linkages are robust enough for their purpose, are properly supported where necessary and are as slop free as possible and that all control surface hinges and horns are fitted correctly.
- ❖ It is recommended that you use soldered connections re-chargeable battery packs in your radio control equipment. Dry batteries may be adequate for use in transmitters but their use in airborne battery packs is not recommended.
- ❖ With new or repaired radio control equipment, a ground range check should be performed, preferably with the equipment installed in a model. With the majority of radio equipment look for a minimum ground range of around 50 metres with the transmitter aerial down and the model's controls still functioning correctly with no 'jittering'.
- ❖ It is also good practice to carry out a ground range check on your radio equipment at regular intervals, at least every few months, and a check is advisable if the equipment has not been used for a month or two.
- ❖ When starting an engine, make sure that the model is restrained and cannot move forward.
- ❖ When preparing for a flight, check that transmitter trims, rate switches etc. are in their correct positions and that each control surface on the model moves freely and in the correct sense.

- ❖ Immediately before take-off, flight controls should be checked again for full, free, and correct movement under full power if applicable. If there are any doubts as to their operation, do not fly.
- ❖ Familiarise yourself with your flying area, noting where the no-fly areas are. These can include overflights of the pits and spectator areas. Also, note any access driveways or footpaths in the area. These may be unrestricted public use facilities.
- ❖ Before take-off, check that both ground and sky are clear and never take off or land towards other pilots, spectators or the 'pits' area.
- ❖ Maintain a clear view of the model and allow plenty of room between the flight path and spectators, other flyers, or model 'pit' areas. Avoid flying between yourself and spectator or 'pit' areas, especially when landing.
- ❖ **Always announce your intentions, especially when landing or taking-off. Alert, other model aircraft pilots that you are either taking-off or landing by verbal means. This will ensure that the landing area and take-off path can remain clear and safe to use.**
- ❖ Avoid overflight of houses, domestic gardens, car parks, traffic, or spectators. You have no control over people walking by at a reasonable distance from your take-off/landing area, so you should take care not to overfly them at low level.
- ❖ At any sign of malfunction or an unexpected loss of the model's parts, land as soon as it is safe to do so.
- ❖ When you decide to land, never assume that the landing area is clear. Always look and be prepared to land in a safe place away from your planned landing area if necessary. In all cases, the safety of people is paramount.

A.2 Pre-flying session checks on arrival at the flying site, CHECK:

- ❖ the airframe for any transit damage.
- ❖ that servos, linkages and any hatches are secure.
- ❖ the undercarriage for secure fixing and correct alignment.
- ❖ the propeller for damage and secure fixing.
- ❖ that control surfaces are secure and move freely.
- ❖ the engine is securely attached to the airframe.

A.2.1 Check before each flight (FM Transmitters)

- ❖ If frequency control is in operation, obtain clearance to transmit.
- ❖ Switch transmitter ON, then receiver ON. Check that all controls operate freely and in the correct sense. Check that all control surfaces are in their correct positions with the transmitter trims at neutral.
- ❖ Look for any minor radio malfunctions such as slow or 'jittery' servos, glitches etc. If in doubt, do not fly.
- ❖ After starting a liquid-fuelled engine, allow it to warm up, check that the pick-up from idle to full power is satisfactory. Hold the model with its nose pointing upwards at a steep climbing angle for ten or fifteen seconds and check engine operation at full power. If an engine falters or cuts it is usually set too lean and must be re-tuned. Repeat the test until the engine runs correctly in the nose-up attitude.
- ❖ With the aircraft held securely on the ground, open up again to full power and recheck all flying controls again.

- ❖ Double Check that all transmitter trims, rate switches, mixers etc. are in their correct positions and that the transmitter meter is 'in the green'.

Happy New Year 2021

As we make the leap from 2020 into 2021 slowly making our way out of this dreadful global pandemic lets hope it's a better one then last. Its around this time of year, we normally undertake the traditional assessment of our annual predictions for the year and check the accuracy of our crystal ball when recalibrating for the year ahead. This exercise in 2021 is inevitably more challenging than usual, as the COVID-19 pandemic has knocked the stuffing out of many. Living in the good old state of WA has been an absolute Godsend – it's probably better than winning the lottery. That said let's not become complacent as our borders slowly come down and life slowly gets back to some form of normality. The virus has not gone away, and we have a long way to go before everyone is out of danger. Please remember to sign the '**contact tracing register**' when you attend the Field, which is mandatory, and continue to carry out all COVID-19 Safety protocol measures i.e., washing hands etc. On behalf of the WAMASC Chairman and his Committee we sincerely wish one and all a great New Year.



SAFE FLYING

Aviation is the branch of engineering that is least forgiving of mistakes.