



AERO ENGINE CRAFT

COMPANY INTRODUCTION:

Aero Engine Craft is developing contrail-free aero-engines for the reduction of global warming and to induce artificial rain during aircraft flight through on-board water recovery from fuel emissions; creating a vision of the future for the aviation industry whereby it can not only reduce aviation induced global warming but also adopt an approach to treat the fuel emissions as a resource. A revolutionary technology is employed that eliminates contrails at source and recovers water from fuel exhaust emissions as a net positive product. This is a true definition of a disruptive technology; a global first attempt to create water within the aero-engine from the exhaust plume during flight, carry it aboard and release it as rainfall prior to landing. Our product is a low cost alternative to aero-engine redesign, and offers revenue potential to the aviation industry while solving a crucial environmental challenge.

The core technology is based on the research outcome of a PhD study conducted by Dr. Sarah Qureshi at the Propulsion Centre, Department of Aerospace Engineering, Cranfield University UK in collaboration with the inventor of the technology Mr. Masood Latif Qureshi. Aero Engine Craft is set up to convert this patented technology into a full scale commercial application ready to be used by modern civil transport aircraft. The business is modelled as a circular economy creating value for global engine manufacturers, aircraft manufacturers and airlines by providing compliance to environmental standards and revenue through emission trading and artificial rainfall. Aero Engine Craft aims to mark the beginning of the first contrail-free aircraft flight in the world!

CONTRAIL-FREE AERO ENGINES:

Recent trends indicate that the aviation industry is now being redefined by numerous environmental challenges which include contrails. Contrails are artificial cirrus clouds that are created by the atmospheric condensation of the supersaturated water vapor that is present in the exhaust emissions as a combustion by-product. According to the emission index of water, 1.25 kg of water is produced for every 1 kg of kerosene fuel burn. In the wider context of the environmental impact of aviation, contrails created through aero emissions disturb the atmospheric balance and affect the earth's radiation budget either by reflecting sunlight back to space or by trapping the infra-red radiation emitted by the earth's surface (greenhouse effect). The radiative effect of contrails is said to vary around 10mW/m². According to IPCC, contrails cover 0.1% of the Earth's surface at present and this is likely to rise to 0.5 % by 2050. This constitutes a considerable proportion of the aviation's contribution to global warming at 25K Watts. Studies have also proven that the global warming potential of contrails is five times that of carbon-di-oxide. Hence a reduction in the water footprint is equally important as that of the CO₂ footprint. Contrail avoidance therefore remains the current focus of the aviation industry.

A contrail-free aero-engine is designed to reduce aviation induced global warming through the development of a pressure-based turbomachinery defined as the water expeller that is introduced as a modular attachment to a standard aero-engine. It encompasses a condensation and containment mechanism for the exhaust water vapour content of emissions. This mechanism intends to eliminate the source of contrail formation. This is a unique pressure based condensation system devised specifically for airborne applications and is a novel addition to the family of gas-turbine components.

Since water is created during the course of condensing the emissions, artificial rainfall can be induced at an altitude of naturally occurring low level precipitation clouds while the aircraft is descending and flying below its cruise altitude. Direct rainfall can be precipitated to the ground within a radius of 17 km of the landing airport depending on the direction of the approach of the aircraft to the airport if water is released from the aircraft once it descends to an altitude of around 2500m (nearly 8000 feet) above sea level. This water can continue to being released until the aircraft lands. The time duration for this process would be around 5 minutes.

Not only does our technology reduce the aviation industry's contribution to global warming by effectively eliminating contrails, but it also signifies a positive contribution by the aviation industry towards meeting the global challenge of water scarcity by creating localized rain in the process. Artificial rain can be a major revenue generator for the airlines employing this system. The implementation of this technology shall shift the negative impact of aviation on the global environment towards a positive contribution from the aviation industry towards the environment.

Our primary market includes global aero-engine manufacturers for the installation of the core device into the engine (in-service and pre-sales) and global airframe manufacturers for the integration of the auxiliary systems into the aircraft. This is essentially a monopolized business. At present, there are three major market players for commercial engines; Rolls-Royce, GE Aviation and Pratt & Whitney. Similarly there are two major aircraft manufacturers in the world; Airbus and Boeing. Currently there are 55,800 engines in service growing at a rate of 3.4 % per year. The base year is 2015 and the growth rate is applied according to industry projections. In addition, there are 25000 commercial airplanes with an average of 2 engines per aircraft. A conversion rate of only 5% engines per annum is assumed. Nearly 3500 engines will acquire this technology in 2024. This number could then be extrapolated according to the annual growth rate.

The concept is very unique and the design is patent-protected. It's airworthiness, simplicity, and ease of implementation within the ecosystem sets it apart. The design of this device and the technology involved in its development are synergistic with the current technology employed by aero-engine and airframe manufacturers. Hence, this device can be easily incorporated within the existing framework of aero-engine and aircraft design. Another unique specification of this technology is that it is an add-on and can therefore be integrated with existing aircraft engines. Hence it is applicable to both in-service and pre-sales engines. Manufacturers lease each component of an aero-engine to airlines, in a modular fashion, and either charge one time to cover the cost or use a "performance by the hour" model. Our device can also be treated as a module and charged for in a similar fashion once the engine is upgraded with this technology.