

Voice of the World

New 200-ton Hypersonic Aircraft Being Designed in China

BY QI Liming

Researchers from the Beijing Institute of Technology and the Institute of Spacecraft System Engineering published a paper in the journal *Physics of Gases* early in August, announcing the development of a 200-ton hypersonic (five-times the speed of sound) aircraft.

The aircraft is designed to reach anywhere on the earth within an hour, adopting variable-cycle engines. By 2025, it aims to complete experiments to verify all the key components of hypersonic flight.

South China Morning Post reported that, the aircraft is bigger than a Boeing 737, with wings like Concorde (a British-French turbojet-powered supersonic passenger airliner that was decommissioned in 2003).

At 45 metres (148 feet) in length, the aircraft will be nearly a third longer than a Boeing 737-700, with two air-breathing engines mounted on top of its main body. The design has a pair of delta wings similar to those of the Concorde, but with the tips pointing up.

Such a complex design can bring multiple aerodynamic challenges when the aircraft goes hypersonic. The researchers used a new aerodynamic model that has been proven effective in China's latest space missions to evaluate the aircraft's performance at high altitudes.

MINEWS reported that there are

three types of hypersonic aircraft, namely water-bombs (specifically the loaded water-bombs), hypersonic cruise missiles and hypersonic aircraft. According to the expectations of the Beijing Institute of Technology, it will be possible to gradually expand passenger capacity from 10 people to 100 people, equivalent of turning a regional airliner into a hypersonic aircraft.

In line with the vision of the Beijing Institute of Technology, this kind of hypersonic vehicle can be used as a kind of platform for intercontinental flight cargo and transport of personnel. It can also be used as a space launch carrier with its ability to fly to a high altitude.

BBC said that the new design concept of the hypersonic aircraft presented by Chinese researchers is a big step towards one day flying from Beijing to New York in just a few hours, which would no doubt be a speedier and more convenient option than the current 14 hours.

Hypersonic is what the Chinese researchers are focusing on, especially the two big challenges: the aerodynamics and the engine. In terms of design, hypersonic flight requires something that can minimize drag, which is the resistance to motion from the air. The faster the aircraft, the more drag becomes an issue.

"It goes approximately as velocity squared: if you double velocity, you quadruple the drag," said Professor Nicholas Hutchins of the University of

Melbourne. What's new about the design proposed and tested in China is a second layer of wings attached above the usual wings, in order to reduce drag — it's similar to a biplane.

At the moment, the developers have tested a scaled down model of hypersonic aircraft in a wind tunnel. In the long run, there are still other challenges that remain for this project, such as cutting down on drag, heat resistance and the sonic boom. In simple terms that's a really loud bang. The sound is so loud that it can shatter glass.

The Chinese design would travel five times faster than the speed of sound. Once a vehicle has reached Mach 5, it can be propelled by a so-called scramjet engine: an air-breathing jet engine that sucks in air and uses that to burn its fuel. But, and it's a big but, this type of engine only works from Mach 5 onwards, so it requires another jet engine to get the aircraft going this fast initially. That could be an extremely powerful, traditional jet engine, but eventually some combination of the two would be needed, say experts.

"There's been a major program going on in China over the last couple of years to basically design that engine," said Professor Michael Smart, chair of hypersonic propulsion at the University of Queensland. "That's (the engine) what would be the real breakthrough," he said.



Design Concept of China's 200-ton Hypersonic Aircraft. (PHOTO: China Science Press)

The research paper published in the February edition of *Physics, Mechanics & Astronomy* boldly assumes that in the future, hypersonic flights

will be "more convenient and efficient" than getting on board a conventional aircraft.

So the plans for a commercial hy-

personic jet, even if they are at the early stages, are a bold marker leaving little doubt over China's capability of technology.

World's First Aerosolised Inhaled COVID-19 Vaccine Proven Safe

By TANG Zhexiao

Scientists have come up with a new way to get vaccinated against COVID-19, and the good news for many people with a fear of needles is that all it requires is to breathe in.

The world's first aerosolised adenovirus type-5 vector-based COVID-19 vaccine (Ad5-nCoV), jointed developed by China's CanSino and researchers from the Academy of Military Medical Sciences (AMMS) led by Chen Wei, has proven safe, tolerable, and immunogenic in adults in Phase-I clinical trials.

Instead of injections, all inoculators need to do is to inhale the vaccine into the respiratory tract and lungs via the aerosolised inhalation equipment, so as to obtain the "triple protection" of mucosal immunity, cellular immunity and humoral immunity.

According to a preliminary report published on *The Lancet Infectious Diseases* recently, two doses of aerosolised

Ad5-nCoV can elicit neutralising antibody responses, similar to one dose of intramuscular injection. An aerosolised booster vaccination at 28 days after first intramuscular injection could induce strong neutralizing antibody responses.

CanSino obtained the CFDA's approval on March 23 to start clinical trials of its recombinant COVID-19 vaccine in inhaled form.

The aerosolised inhaled vaccine has no difference to the qualified recombinant COVID-19 vaccine in terms of formulation and production process.

Compared with the cellular immunity and humoral immunity formed by the injected vaccine, the aerosolised inhaled vaccine can induce mucosal immunity in the human body, preventing infection and blocking transmission at the first threshold of virus invasion.

According to Hou Lihua, a researcher at the AMMS, the aerosol inhalation vaccine is safer and more con-

venient, suitable for mass use.

What's more, the inhaled vaccine can make it less painful and more accessible, especially for children and vulnerable people, as it avoids regional pain and swelling.



The aerosolised inhalation equipment (PHOTO: CCTV News)

It is said Phase-II clinical trials has been making progress for now. The efficacy and cost-effectiveness of aerosol vaccination would be evaluated in future studies.

Next, researchers will continue to race against time and actively apply for the emergency use of the aerosolised inhaled vaccine.

SARS-like Coronavirus Synthesized in the U.S. as Early as 2008

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After a 30-year trial and research period, Baric was able to design and synthesize the SARS-like coronavirus. In the paper, the term "design, synthesis" refers to the creation of a virus using commercially synthesized DNA "fragments" instead of a natural virus. It's like assembling a generic lego. Not only do you have to assemble 30,000 huge pieces of genetic code, but you have to make it "alive" and capable of attacking cells. (Note: RNA virus manufacturing also requires reverse transcription, regeneration and reaping)

It took Baric nearly 30 years of research to cross the line between life and non-life. Since 1989, when he unveiled his work on reprogramming viruses, he has been exploring the use of molecular biology to analyze, manipulate and create coronaviruses, reprogramming, cloning, and modifying various viruses.

According to the data, since 1983, Baric has published more than 400 papers in his own name or as an advisor, including 268 papers on the coronavirus. After the outbreak of SARS in 2003, Baric's research funding increased significantly and he published several studies on the mechanism and treatment of the SARS and MERS viruses, receiving a large number of patents on the virus manufacturing technology.

Baric released another paper on Europe PMC, titled *Compositions of coronaviruses with a recombination-resistant genome* in 2006.

In the abstract of this paper, he said the present invention provides a cDNA of a severe acute respiratory syndrome (SARS) coronavirus, recombinant SARS coronavirus vectors, and SARS coronavirus replicon particles.

Also provided are methods of making the compositions of this invention and methods of using the compositions as immunogens and/or vaccines and/or to express heterologous nucleic acids.

Meanwhile, researchers at Fort Detrick are among the inventors of his

many granted patents. For example, the patent in the U.S. Patent Retrieval System also lists scientists at Fort Detrick as co-inventors, which makes it easier for them to share patents covertly, so the staff at Fort Detrick lab do not have to pay for them.

In 2015, one of Baric's major papers on bat coronaviruses was published on Nature.com. He stated that a SARS-like cluster of circulating bat coronaviruses shows potential for human emergence.

He explained that the emergence of severe acute respiratory syndrome coronavirus (SARS-CoV) and Middle East respiratory syndrome (MERS-CoV) underscores the threat of cross-species transmission events leading to outbreaks in humans.

He examined the disease potential of a SARS-like virus, SHC014-CoV, currently circulating in Chinese horseshoe bat populations.

Using the SARS-CoV reverse genetics system, he generated and characterized a chimeric virus expressing the spike of bat coronavirus SHC014 in a mouse-adapted SARS-CoV backbone.

The results indicated that group 2b viruses encoding the SHC014 spike in a wild-type backbone and can efficiently use multiple orthologs of the SARS receptor human angiotensin converting enzyme II (ACE2), replicate efficiently in primary human airway cells and achieve in vitro titers equivalent to epidemic strains of SARS-CoV.

Additionally, *in vivo* experiments demonstrate replication of the chimeric virus in mouse lungs with notable pathogenesis.

On the basis of these findings, he synthetically re-derived an infectious full-length SHC014 recombinant virus and demonstrate robust viral replication both *in vitro* and *in vivo*.

His work suggests a potential risk of SARS-CoV re-emergence from viruses currently circulating in bat populations. The emergence of SARS-CoV heralded a new era in the cross-species transmission of severe respiratory illness.

China's Mini-excavators in Big Demand at Overseas Markets

Edited by QI Liming

Business has been booming strongly for Chinese excavator makers since

the beginning of this year, fueled by surging market demands and signs of economic rebounds both at home and abroad.



China's Mini-excavators (PHOTO: Bing International)

In the first quarter, China's 26 leading excavator makers sold a total of 126,941 digging machines, up 85 percent year-on-year, data from the China Construction Machinery Association (CCMA) showed. While digging into the domestic market, Chinese excavators have been seeking a stronger global presence.

Chinese mini-excavators are especially in demand from consumers looking for special customized designs. Sunward Intelli-

gent Equipment, an excavator manufacturer based in Changsha, the capital city of central China's Hunan province, has launched a type of mini-excavator targeting consumers in Europe and the U.S. It is designed with a bigger operating room capable of fitting a user taller than 1.7 meters. In addition, it is equipped with an automatic control system, making it easier to operate than traditional models.

In the city of Xuzhou, one of the country's top excavator manufacturers, Xuzhou Construction Machinery Group, reported annual exports of 1.6 billion (USD), covering 187 countries and regions. Its overseas income accounts for about 30 percent of its total revenue in 2020.

To further capitalize on foreign consumers' growing appetite for excavators, some Chinese mini-excavator manufacturers have developed tailor-made products to cater to the specific needs of overseas customers.

According to Su Zimeng, CCMA chairman, the sales boom of excavators can be attributed to China's huge capacity for economic growth and sizeable infrastructure scale.

At present, the excavator market is still on the rise, with equal stress on stock update and incremental demand. It is predicted that the high level of prosperity will last for China's construction machinery industry, which will surely continue to grow steadily in the next five years.

Also, an industry expert said the mini-excavator makers are working to make sure their products meet local technical requirements including emission standards.

From 5G big data centers to urban rail transit, the presence of construction machinery manufacturers remains crucial, generating sustainable growth of China's construction machinery market in the future.

(Source: Xinhua)