CENTRE FOR JOINT WARFARE STUDIES

CENJOWS

HYPERSONIC MISSILES – CHINA'S DF-17

1. **China Unveils Camouflaged DF-17 Hypersonic Missiles that could be Invisible to Enemy Surveillance Systems.** According to state-owned *Global Times,* China has reportedly upgraded its DF-17 hypersonic ballistic missile system, with a new transporter erector launcher (TEL), which would enhance the survivability of the DF-17 against enemy surveillance systems.

2. A video released on the occasion of the 5th founding anniversary of PLA's Rocket Force had shown the upgraded DF-17 missile system. In the footage, the TEL was shown moving in the desert terrain with an integrated cover for the missile, according to Global Times.

3. The earlier TELs for DF-17 showed the missile 'as-it-is' on the top, exposed, while the newer one has it all covered and camouflaged. It enhances the system's survivability against enemy surveillance systems and aerial strikes.

4. Although the video did not reveal whether the new vehicle was indeed related to the DF-17, a Shanghai-based news website *eastday.com* identified it as an upgraded version of the DF-17 hypersonic missile.

5. A report by the China Central Television (CCTV) said the new 'weapon' was first shown in the 2019 military-day parade. Interestingly, the DF-17 also made its debut at the same parade in 2019. Therefore, it

could be safely assumed that the missile system shown in the video is the hypersonic DF-17.

6. **The DF – 17 (Dong Feng-17) Missile: At a Glance**

(a) **Originated From:** China
(b) **Possessed By:** China
(c) **Class:** Medium-range Ballistic Missile (MRBM) equipped with a Hypersonic Glide Vehicle (HGV)
(d) **Basing:** Road-mobile
(e) **Length:** 11 m
(f) **Launch Weight:** 15,000 kg (Solid-fueled).
(g) **Payload:** Conventional or nuclear
(h) **Speed:** Mach 5-10 (1.72-3.43 km/s)
(j) **Range:** 1,800-2,500 km
(k) **Status:** Operational

DF-17 Development

7. China has invested significant resources in the DF-17 and its other hypersonic weapon programs. The People's Liberation Army (PLA) has reportedly done so to counter adversary missile defenses, as well as to develop a fast, long-range, high-precision strike capability that "leaves enemies with little time to react."

8. In 2018, one U.S. official noted that China had conducted around 20 times the number of hypersonic weapons tests as the United States had in the preceding decade.

9. China's 10th Research Institute is responsible for developing the DF-17 and other Chinese HGVs. Also known as the "*Near Space Flight Vehicle Research Institute*," the organization operates under the China Aerospace Science Industry Corporation (CASIC) 1st Academy. U.S. officials first confirmed the existence of DF-17's in 2014, identifying it as the Wu-14. News media later identified the missile as the DF-ZF – likely an early Chinese designation. Between January 2014 and November 2017, China conducted at least nine flight tests of the DF-17 at the Taiyuan Satellite Launch Centre in Shanxi Province.

Specifications

10. The DF-17's booster appears to be the same as that used for China's **DF-16** ballistic missile. Its accompanying DF-ZF HGV reportedly reaches speeds of Mach 5-10 (1.72-3.43 km/s) in its glide phase. U.S. intelligence assessments suggest that the DF-17 possesses a range between 1,800 and 2,500 km. Although Chinese commentators have

emphasized the DF-17's conventional mission, the missile may alternatively carry nuclear warheads.

11. The DF-17 has demonstrated a high degree of accuracy in testing, with one U.S. government official saying a test warhead "within meters" of its intended, stationary target. U.S. defense officials have also said the DF-ZF HGV performed "extreme maneuvers" and "evasive actions" in previous test flights.

12. Some reports suggest China could develop the DF-17 into a second-generation anti-ship ballistic missile (ASBM), further enabling China's strategy to deter U.S. regional intervention. In January 2019, PLA officials claimed to have an anti-ship DF-17 variant under development. In October, it was reported that the missile was deployed at China's Fujian and Zhejiang, across Taiwan, amid Beijing's tensions with the island nation.

Comments

13. In the past few years, several countries have been working on 'new-generation' hypersonic missiles to enhance their military capabilities.

14. With Russia's Zircon, Kinzhal and Avangard, America's ARRW, and India's HSTDV and Shaurya, China has been making rapid strides in the field as well. The DF-17's status remains unclear. Its appearance in China's October 2019 military parade, however, has raised speculation that it may have entered PLA service.

15. ***The DF-17 is a solid-fueled medium-range ballistic missile mounted on the DF-ZF hypersonic glide vehicle. The missile is capable of carrying both conventional and nuclear warheads with ranges up to 2,000 kilometers and more, achieving speeds of Mach 5,*** the threshold to qualify an object as hypersonic. While slower than a conventional ballistic reentry vehicle, HGVs' higher maneuverability and lower-altitude flight make them harder to track and predict their flight path, challenging legacy ballistic missile defense systems.

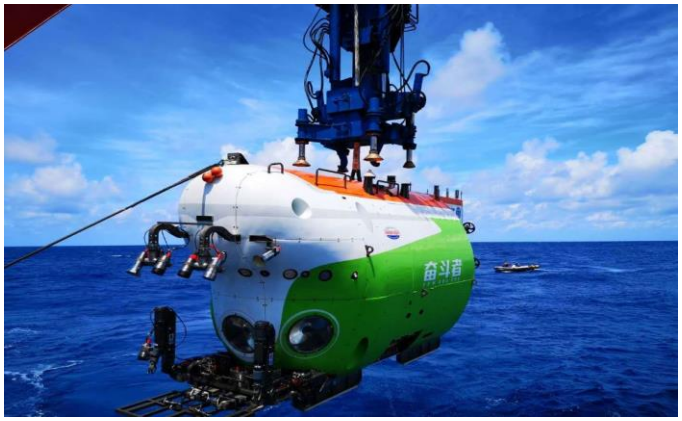
https://eurasiantimes.com/china-unveils-upgraded-df-17-hypersonic-missile-with-shield-against-enemy-surveillance/

https://missilethreat.csis.org/missile/df-17/.COPY

DF-17 on Parade in Beijing: 1 October 2019

MANNED SUBMERSIBLES – CHINESE 'FENDOUZHE'

16. **China's Latest Manned Submersible 'Fendouzhe' Dives to Record Depth.** China's new deep-sea manned submersible *Fendouzhe*, or Striver, set a national diving record of 10,909 meters on 10 Nov 2020, in the Challenger Deep located at the bottom of the Mariana Trench in the Pacific Ocean. The submersible first broke the 10,000-meter milestone by descending to 10,058 meters on 27 Oct 2020. *Fendouzhe*, one of the world's deepest-diving manned submersibles, is capable of carrying a crew of three. It is electrically powered and can operate underwater for 10 hours. *Fendouzhe* manned submersible, successfully completed all sea trials in Mariana Trench; and its mother ship, Explorer-1 (Tansuo-1) brought it back to Sanya Port on Hainan Island on 28 Nov 2020.



China's new deep-sea manned submersible Fendouzhe being lowered into water

17. The Institute of Acoustics, of Chinese Academy of Sciences (IACAS) has developed *Fendouzhe's* acoustic system, including deep-water acoustic communication modem, topography detection sonar, multi-beam forward looking sonar, doppler velocity log and obstacle avoidance sonar; as also carried out system integration of the positioning sonar and inertial navigation equipment. Underwater acoustic communication between *Fendouzhe* and its mother ship Explorer-I, was accomplished in real-time, by transmission of text, voice,

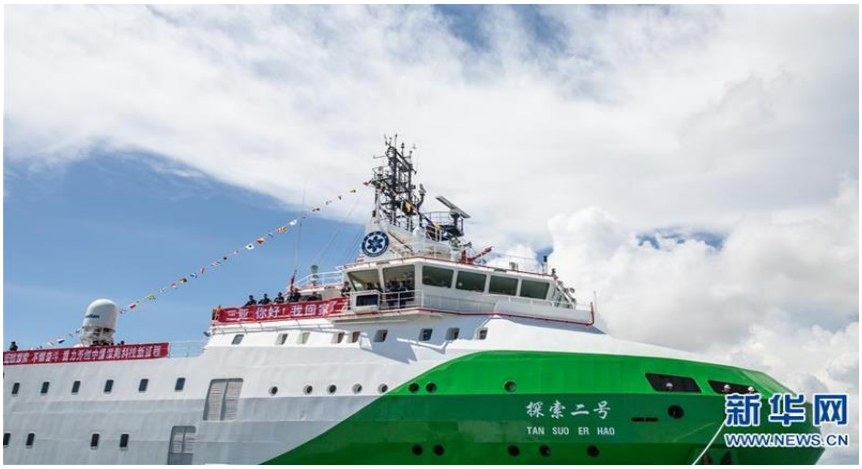
and images from 10,000-meter deep seabed. During the dive on 16 Nov 2020, crew of *Fendouzhe* retrieved three underwater objects – placed earlier on the seabed – with the help of integrated navigation system and sonar equipment.

Fendouzhe submersible with its crew. (Image by IACAS)

18. **Comments**. In 2016, Chinese scientists and engineers from the teams which developed *Jiaolong* and *Shenhai Yongshi* (Deep-Sea Warrior) submersibles launched a project to build a manned underwater vehicle capable of surveying the entire ocean. The vehicle was later named *Fendouzhe*. In June 2012, *Jiaolong* – China's first – deep-sea manned submersible had set national record by diving till 7,062 meters in Mariana Trench. *Shenhai Yongshi*, China's second deep-sea manned submersible, has an operational depth of 4,500 meters. Such deep-sea vehicles can collect samples and data from the deepest part of ocean for hydrothermal, geological and marine biological research.

Source: https://english.cas.cn/newsroom/cas_media/202011/t20201111_249059.shtml

19. **China's 'Explorer 2' Research Vessel also Collaborates with 'Fendouzhe' Manned Submersible Trials.** During joint mission with *Fendouzhe* manned submersible, the *Explorer-2* scientific research ship lowered a deep sea Lander called *Canghai* (vast sea), equipped with high definition cameras. This Lander module was lowered at the same speed as *Fendouzhe* submersible; and successfully docked with it on the ocean floor, at a depth of more than 10,000 meters. Headquarters of China Media Group – parent company of the Lander – successfully used indigenous Ultra-high Definition 4K technology to carry out real-time video broadcast from the seabed at a depth of 10,000 meters. The Lander can not only send back real-time images from the bottom of the ocean, but it can keep a record of every move by *Fendouzhe*. To better accomplish the job, *Canghai* Lander also had a small assistant – *Lingyun* – which could move around freely in the deep sea and provide lighting at different angles for the cameras.



China's 'Explorer-2' (Tansuo er hao) research vessel in Port

20. In addition to carrying the Canghai lander, the *Explorer-2* also carried another manned submersible developed by China, the *Shenhai Yongshi*. This manned submersible also dived in the Mariana Trench and acquired large amount of scientific data and samples, for further study about geological structure of the area. The *Explorer-2* completed its research missions in Mariana Trench and returned to Sanya Port on 17 Dec 2020.

21. **Comments.** The *Explorer-2* research vessel continued its mission in Mariana Trench after completing joint operations with the Explorer-1 mother ship and *Fendouzhe* manned submersible. The *Shenhai Yongshi* manned submersible carried by it completed its 100th dive of 2020 – and 325 overall. It set a new record of 12 dives in eight days, with an average underwater time of eight hours and 27 minutes. It is also the first time in the world that a diving operation of such high frequency was conducted.

Source: https://english.cas.cn/newsroom/cas_media/202012/t20201217_256794.shtml https://news.cgtn.com/news/2020-11-13/What-s-new-with-China-s-manned-submersible-s-second-10-000-meter-dive--VnKGLb2M9i/index.html

22. **China's Second Type 075 Amphibious Assault Ship (LHD) Starts Sea Trials.** China's second Type 075 amphibious assault ship embarked on its first sea trial on 22 Dec 2020, just eight months after its launch in Apr 2020. The second Type 075 left Hudong Zhonghua Shipyard in Shanghai, and sailed toward the East China Sea for a test voyage. This indicates that outfitting of the second Type 075 Landing Helicopter Dock (LHD) ship must have progressed very fast, since the ship was launched on 22 Apr 2020. By comparison, the first Type 075 sailed for its maiden voyage on 05 Aug 2020, more than 10 months after its launch on 25 Sep 2019. Maiden sea trial of the first ship had lasted 19 days. The second ship's maiden voyage could follow a similar pattern.

23. **Comments.** China's fast development of the amphibious assault ships is a world record. Type 075 LHD, is comparable to the US' Wasp-class amphibious assault ship. Amphibious assault ships mainly conduct vertical deployment and landing missions on islands and reefs. These ships with large flat flight decks can transport troops using helicopters, much faster than landing craft. They can also operate with aircraft carriers, letting the carriers seize air superiority as they transport troops, tanks, and armour vehicles to the shore.

24. With two Type 075s undergoing sea trials and one more under construction, China will soon gain significant amphibious landing capabilities, which are vital for dominating areas like the Taiwan Straits and the South China Sea. In military operations other than war, amphibious assault ships can also be deployed in anti-terrorism, anti-piracy, sea lanes protection, disaster relief, and humanitarian aid missions.

Source: https://www.globaltimes.cn/page/202012/1210707.shtml

SPACE TECHNOLOGY – CHINESE LONG MARCH 8

25. **China Launches Long March 8 Rocket on Debut Flight, Plans for Reusable Booster.** China has embarked on new rocket boosters on the Long March 8 that will eventually be reusable and make upright landings similar to SpaceX's Falcon 9. The new two-stage rocket uses two side boosters, with its main stages based on the designs of other Chinese rockets. The first stage is based on the Long March 7 and the second stage is based on the Long March 3.

26. The **first long march 8** was launched from the Wenchang Spacecraft Launch Site in south China's Hainan province on 20 Dec 20 at 11:37 p.m. EST. The **rocket successfully flew five test satellites into orbit, and used environmentally friendly liquid hydrogen and liquid oxygen fuels for the launch**.

27. *Presently, it is not clear that whether first rocket was reusable, but China has disclosed plans to reuse long march 8 booster* in the coming years. The Long March 8 rocket is *designed for the international commercial space launch market and is expected to fill a gap in launch capabilities for low- and medium-orbit satellites* either to geosynchronous orbits (allowing for gazing consistently at one area of Earth) or to sun-synchronous orbits (which allows for consistent lighting conditions for imaging), depending on the mission needs.

28. The reusable boosters of the rocket will significantly reduce costs and shorten the launch cycle. **It is estimated that to turn around a booster for another launch would be possible within 10 days**.[1]

29. The Indian Space Research Organization (**ISRO) too has outlined plans to develop reusable rockets along with other areas** in space launches namely, development of heavy lift launchers, advanced propulsion and to foster private space activities across the 2020s.[2]

CHINESE AVIATION TECHNOLOGY

30. **China's Modernization of Military Aviation Arsenal.** China has plans to develop and produce modern, advanced aviation equipment in the next five years, and the debut of China's first long-range, stealth-capable strategic bomber, the country's third and electromagnetic

---

[1] https://www.space.com/topics/china-space-program

[2] https://spacenews.com/india-aims-for-reusable-rockets-advanced-propulsion-in-decadal-spaceflight-plan/#:~:text=HELSINKI%20%E2%80%94%20The%20Indian%20Space%20Research,space%20activities%20across%20the%202020s.&text=Every%20ISRO%20center%20and%20unit,been%20laid%20out%20in%20brief.

catapults-equipped aircraft carrier alongwith FC-31 aircraft are likely to be fielded[3].

31. During the last five years, a large number of impressive weapon systems have been developed for the services. Some of these systems are: *J-20 stealth fighter aircraft, Y-20 large transport aircraft, Z-20 utility helicopter, H-6N strategic bomber, Type 055 large destroyer, Shandong aircraft carrier, Type 15 light tank, PCL-181 truck-based howitzer, DF-26 anti-ship ballistic missile, DF-17 hypersonic missile and DF-41 intercontinental ballistic missile*[4].

32. The 14th Five Year Plan period is likely to be a very fruitful period for the PLA Air Force (PLAAF), as the long-range, stealth-capable strategic bomber will likely make its long-expected public debut[5]. China has been reportedly *developing the new bomber, the Xi'an H-20*, for many years, and its maker, the state-owned Aviation Industry Corporation of China, has been hinting its development since 2018.

(Weibo/Handout)

33. The *aircraft is expected to be a fourth-generation bomber, compared to China's current H-6 bomber* platform as it will come out with world-leading design and technologies. Its stealth capability and range are *expected to be as good as the US' B-2 Spirit stealth* bomber.

34. The *Xi'an H-20, is believed to be a large, stealthy bomber which would supplement and eventually replace the H-6,* a 1950s-era design that China has steadily upgraded over the decades. *The H-20, is expected to be showcased sometime in the next two years*. The H-20 is depicted as having a flying wing design that trades speed for range and stealth and is likely **to carry a bomb load of 45 tons, far more than the B-52H Stratofortress's 35 tons and the B-2 Spirit's 20 tons**[6]. The

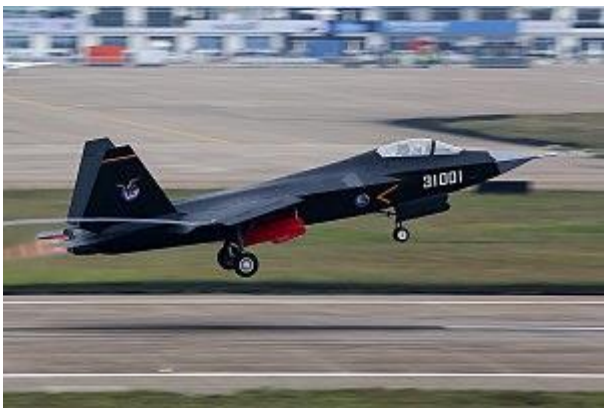
---

[3]Liu Xuanzun and Leng Shumei; https://www.globaltimes.cn/content/1205446.shtml
[4] ibid
[5] idid
[6]Kyle Mizokami; https://www.popularmechanics.com/military/aviation/a34908283/china-new-h-20-stealth-bomber-powerful/

bomber is expected to have a *range of at least 12,000 km* that would put **Hawaii within reach of the H-20. It would also put all 50 U.S. states within striking distance if the H-20 took an Arctic flight route**[7].

35. In other warplane developments, China is expected to mass-produce and improve the J-20 fighter jet, with its engines replaced with more powerful ones; drones and artificial intelligence will also see advanced developments.

36. A type of *aircraft carrier-based stealth fighter jet, believed to be developed based on China's second type of stealth fighter jet the FC-31, could also make its debut in the coming years*, along with the aircraft carrier-based early warning aircraft the KJ-600.



(https://en.wikipedia.org/wiki/Shenyang_FC-31)

37. China's **civil aviation future reportedly, rests with the Comac C-919** aircraft: China's challenge to Boeing and Airbus is off to a slow start, but the country has long-term goals in mind[8]. The plane is part of the country's long-term goal to become a leader in technology and heavy manufacturing. Exporting these aircraft to the world is one part of this effort; it would also allow the country to become more self-sufficient in everything from telecom equipment to transportation. By building its own civil aircraft industry, an area where the country remains dependent on Western suppliers, China will save billions of dollars and achieve more strategic autonomy.

---

[7] ibid

[8] Kent German; https://www.cnet.com/features/chinas-aviation-future-rests-with-the-comac-c919-aircraft/