

FUGO Japanese Fire Balloons

FIRST INTERCONTINENTAL WEAPON PIGGYBACKED ON THE DISCOVERY OF THE JET STREAM

BY MICHAEL GOTT

The Fu-go

“Windship Weapon”

project was a World War II era plan by the Japanese military to attack the mainland United States with explosive-laden hydrogen balloons carried across the Pacific Ocean. The unmanned Fu-go balloon bombs were the result of many years of Japanese research on balloons as a means of carrying propaganda or explosives into enemy territory. This wartime enterprise also helped to facilitate meteorological understandings of global atmospheric wind patterns, specifically the jet stream. The Fu-go balloons were launched through 1945, and 300 actually reached the U.S. coast, causing the only wartime fatalities on the United States mainland.

The Fu-go project came to fruition under a Japanese meteorologist named Hidetoshi Arakawa, and relied upon the work of another meteorologist, Wasaburo Oishi (1874-1950). Oishi had studied the winds in the upper atmosphere since 1923 and became the first known person to discover the existence of strong westerly winds above Japan. However, in a misguided attempt to create interest in the newly constructed international



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language Esperanto, Oishi wrote and published his work in the little known tongue, which meant his observations went largely ignored. When it was finally recognized, Oishi's work aided the development of successful balloon incendiaries and contributed to the field of meteorology through his discovery of the jet stream over Japan, colloquially referred to as "westerlies."

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The experience of U.S. bombers have often been noted as the earliest accounts of the jet stream, but Oishi observed the westerly winds long before they travelled to Japan in World War II.¹ Oishi was born in Saga prefecture, on the island of Kyushu in southern Japan. He attended the Tokyo Imperial University and would later alternate between studying atmospheric winds abroad and working for the Central Meteorological Observatory in Japan. In December 1924, during an experimental balloon launch to track upper level winds, Oishi noted a strong westerly wind at just about 33,000 feet.² This experiment, along with other data



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collected over the course of several winters, revealed a permanent westerly wind over Japan during the winter.³ This discovery would play an instrumental role in the future development of the Fu-go balloons. Balloon bombs were not new to history during World War II, nor were they new to Japan. The Japanese developed a number of balloon projects, stretching back to the 1930s.⁴ The balloons were made of paper, and came equipped with bombs and sand ballast. The sand was used by the military to identify exactly from where the balloons were originating. The Fu-go project held the most promise and the balloons used by the Japanese during the war have been recognized as "the world's first intercontinental weapon."⁵

With the locomotive piece in place along with a nascent balloon project in the works, the final motivation for finishing the Fu-go balloons came from the Japanese reaction to an attack known as

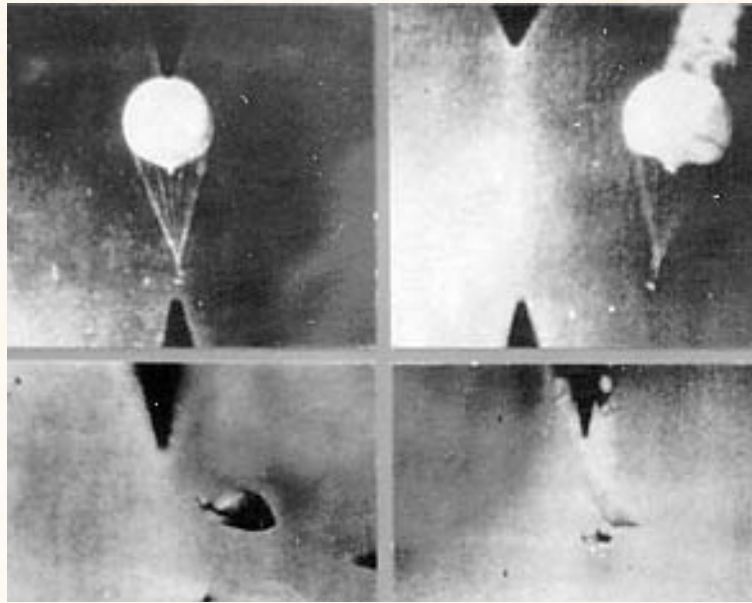
the Doolittle Raid, an air strike by the United States on the Japanese mainland in 1942. The raid aimed at military and industrial targets in several major Japanese cities.⁶ The U.S. organized the raid in response to the Japanese attack on Pearl Harbor in 1941.⁷ It proved particularly significant for the psychological effects it had on the Japanese, as it disillusioned the populace of beliefs, espoused by elites, that Japan was untouchable.⁸ Immediate action would be taken in retaliation for the Doolittle raid, leading Japanese military officials to revisit their old balloon bomb ideas.

Military leaders in Japan placed Hidetoshi Arakawa, a meteorologist at the Central Meteorological Observatory, in charge of reviewing unsolved problems from previous work on the plan, particularly in relation to research on the westerly winds. Once complete, the balloons were sent across the Pacific, at about 10-12km above the earth, where Arakawa's work claimed the "middle-latitude westerlies are very well developed."⁹ Between 1944 and 1945, the Japanese launched 9000 balloons, of which almost 300 are documented to have reached North America, as far inland as Michigan.¹⁰ The plan was to use the balloons to send bombs to North America where they would cause major disturbances, one of the desired results being forest fires. The Japanese believed forest fires could potentially force the U.S. to reallocate resources from

fighting the war to fighting their blazing forests¹¹ The balloons were launched in a six-month window, between November 3, 1944 and April of 1945. The program was discontinued when the U.S. started bombing the Japanese hydrogen factories, making the primary element used in their construction extremely difficult to come by.

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The unheralded attacks on North America only came to the attention of U.S. officials through mysterious reports about strange objects and explosions, however the populace was never alerted and remained unaware of the threat.¹² Bombs landed across North America, from the Aleutians to Michigan, Mexico, Montana, and Wyoming.¹³ While the bombs killed a number of Americans, the death count was much smaller than the possible damage that could have been done.¹⁴ Their potential destruction may explain the reaction by U.S. officials, who downplayed the threat and requested that the press and radio not feature stories about balloon explosions.¹⁵



FIRE BALLOON
Being Shot Down
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When an explosion killed a woman and her five children while tampering with a balloon in the woods of Oregon, officials felt the urge to finally reveal the truth, albeit, in a way that made the threat seem benign.¹⁶ The first use of an intercontinental weapon in warfare thus resulted in the only incident during World War II when American deaths on the continental US were the result of enemy action, as memorialized in Lake County Oregon at the Mitchell Recreation Area. Fortunately for the United States, the Fu-go project was dramatically unsuccessful. Despite its lethal intentions, the project nevertheless helped contribute to our modern understanding of the mechanics of the jet stream.

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1) John M. Lewis, "Oishi's Observations Viewed in the Context of Jet Stream Discovery," *American Meteorological Society*, (March 2003): 358.

2) Ibid, 364.

3) Ibid, 364-5.

4) Robert C. Mikesch, "Japan's World War II Balloon Bomb Attacks on North America," *Smithsonian Annals of Flight No. 9, Smithsonian Institution Press* (1973): 3.

5) Ibid, 1.

6) Ross Coen, *Fu-Go: The Curious History of Japan's Balloon Bomb Attack on America* (USA: University of Nebraska Press, 2014): 14.

7) Ibid, 12.

8) Ibid, 15.

9) Hidetoshi Arakawa, "Basic Principles of the Balloon Bomb," *The Meteorological Research Institute*, VI /3-4, (January 1956): 239.

10) John M. Lewis "Ooishi's Observations Viewed in the Context of Jet Stream Discovery," *American Meteorological Society*, (March 2003): 366.

11) Coen, *Fu-Go*, 25.

12) Ibid, 2-3.

13) Ibid 1, 25.

LEAVING ON A JET STREAM

Jet streams are currents of air that move through the upper-levels of the atmosphere of a planet and are caused by the planet's rotation and atmospheric heating. Earth's major jet streams are known as westerly winds, colloquially referred to as westerlies. Jet streams were not fully understood in the early- to mid-20th century.¹ One important piece of scholarship on the subject was a paper published on the jet stream in 1947, two years after the war, by researchers at the University of Chicago's Department of Meteorology.² Their research on the topic stemmed from the experience of air craft bombers while fighting over the Pacific and Europe during World War II.³ Typical encounters with the strong westerly winds included changes in flight speed and stalled aircraft.⁴

1) John M. Lewis, "Oishi's Observations Viewed in the Context of Jet Stream Discovery," *American Meteorological Society*, (March 2003): 357.

2) *Ibid*, 357.

3) *Ibid*, 357.

4) *Ibid*, 357-8.

FUGO FOOTNOTES, *Cont.*

14) *Ibid*, 1.

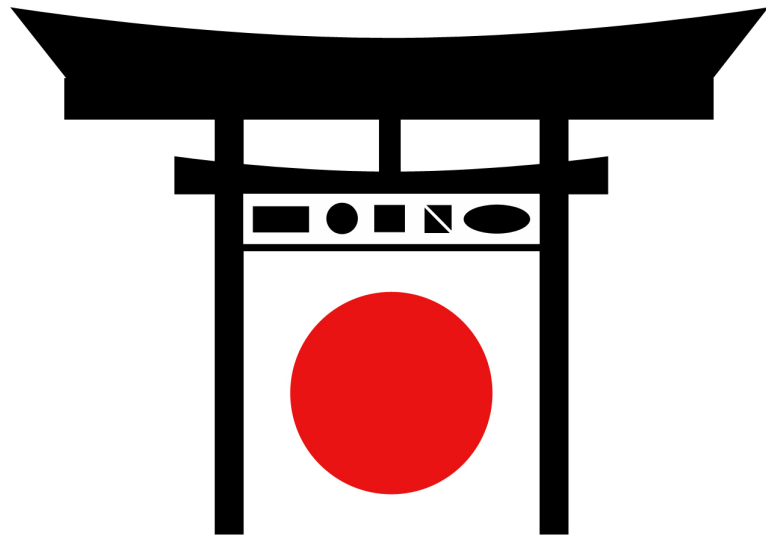
15) *Ibid*, 3, 25-7.

16) Mikesh, "Japan's World War II Balloon Bomb Attacks on North America," 27.

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