

Norden Mk. XV Bomb Sight Integration for Strategic High Altitude Toy Delivery in a Hostile Christmas

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Abstract

Germany has plunged Europe into war. As there have been no Christmas truces offered, we must prepare ourselves to deliver Christmas cheer and presents in a hostile air space. Now that the forces of England and Germany have armed themselves with spotlights, radar, flack guns, and interceptor fighters, I cannot risk low flying present delivery like I have for over a thousand years. We must drop our presents from 20,000ft. This presents the problem of aiming the presents. We have recently learned through our global surveillance system that the Norden Mk XV bomb sight is capable of dropping a single ordinance in a pickle barrel, the same size as a chimney. If this bomb sight is integrated into our sleigh, we could save Christmas. This paper will show definitively that was Allied propaganda.

Keywords: Christmas, High Altitude Strategic Present Delivery, Norden Bombsight, Aerial Protection, Toy Delivery, Crosswind Correction, Toybadier, Box Formation

1. Introduction

Just because the world is thrown into a brutal mechanized war does not mean that Santa stays home on Christmas eve. not all Germans, Italians, and Brits are naughty [1]. Some children have yet to be turned by propaganda and still deserve a real Christmas in these troubling times. Furthermore, some of these fascists have to wake up to some coal to see what I think of them [2].

Three decades ago, Europe fell into a similarly deadly war, but human technology had yet to advance far enough to pose a threat to yours truly [3]. Unfortunately, the air has become a new theater of war and constant bombing campaigns above the Allied and Axis nations have given my reindeer cold hooves. Last year, we barely made it back to Missus Claus alive! Thankfully, the technology now exists to drop presents accurately from 20,000 ft!

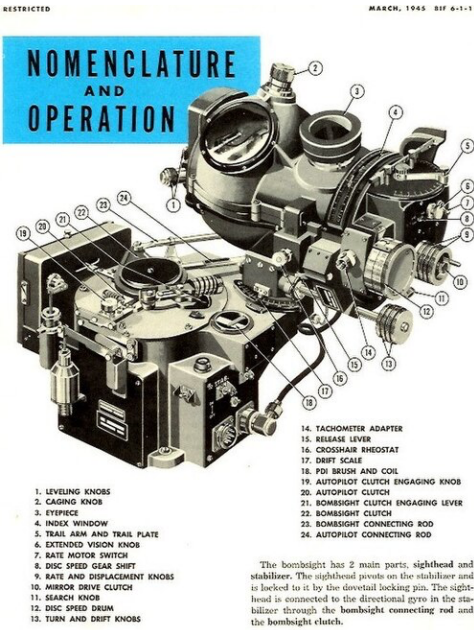


Figure 1: Norden Mark XV Bombsight

Although the Norden Mark XV bombsight is a highly secretive technology, nothing slips past Santa's all-seeing global surveillance spy network [4]. Many of the worst war crimes that will land you on the naughty list can be highly classified [5]. It's become even more necessary to penetrate and judge this behavior behind a shroud of convenient state secrets.

2. Background

The two objectives of an integrated sleigh system are to deliver a payload of general-purpose (GP) Toys down a chimney and survive doing so. By pivoting to high altitude strategic toy delivery, it is important to understand the physics and aerodynamics of falling toys from high altitude in a variety of conditions.

2.1 High Altitude Toy Drop Physics

When a toy is released from a moving sleigh it doesn't fall to the target directly below. It keeps moving according to the direction of the sleigh and wind. The time of the drop is shown below.

$$t_{drop} = \sqrt{\frac{2h}{g}} - t_{drag}$$

According to t_{drop} we may then compute the range as shown in the equation:

$$R_{drop} = V_{sleigh} t_{drop}$$

This range is then adjusted as a vector of the ground velocity of the sleigh seen here

$$R_{effective} = \vec{V}_{ground} t_{drop}$$

Where the \vec{V}_{ground} is computed with air and wind direction:

$$\vec{V}_{ground} = \vec{V}_{airspeed} + \vec{V}_{wind}$$

We have been promised in some very nice pamphlets and films by Norden's company that this is all computed in a mechanical computer within the Norden Bomb sight so that our toybadier elves do not have to do

any math [6]. The physics problem in its entirety may be seen in figure 2 and 3.

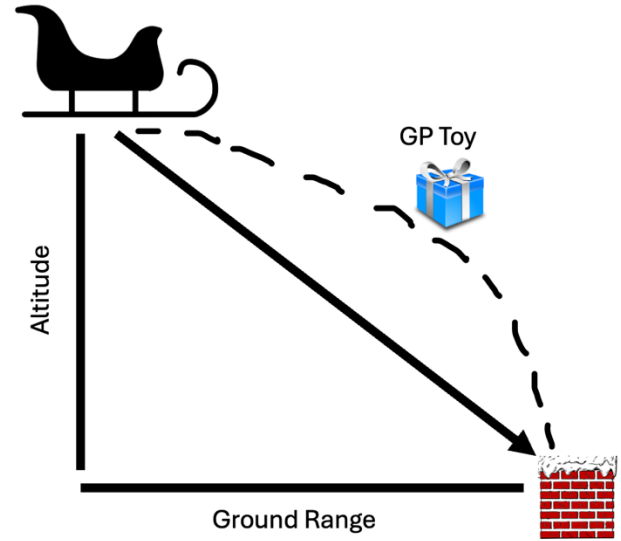


Figure 2: Toy Drop Physics Altitude View

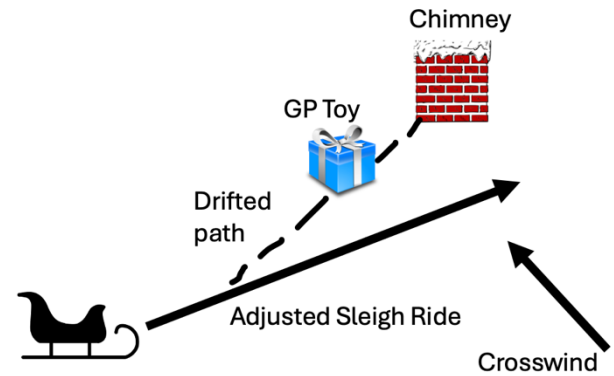


Figure 3: Toy Drop Physics Crosswind Correction

2.2 General Purpose Toy Aerodynamics

In order to calibrate our Norden Bombsight for toy delivery, we must estimate the drag according to GP toys we will be dropping on all the boys and girls of Europe. As shown below [7], vertical acceleration $\frac{dv}{dt}$ may be estimated given the mass m , air density ρ , drag coefficient C_d , present and bow cross sectional area A , and vertical velocity v .

$$m \frac{dv}{dt} = mg - \frac{1}{2} \rho C_d A v^2$$

After calibrating our gift-wrapped and standardized toy delivery chassis, we may estimate the toy delivery angle and velocity in the chart below. Past 30,000ft altitude, all toys will hit their intended chimneys at an approximate velocity of 1050ft/s while a dangerous low flying and slower delivery below 2,000ft AGL will achieve a 300ft/s delivery velocity. Due to this expected impact, the GP Toy's have been designed with a steel casing, we believe should survive the impact through the fireplace safely and roll across the living room towards their intended trees [8].

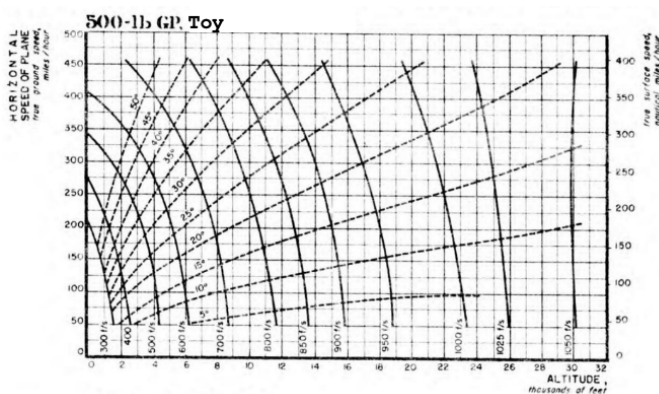


Figure 4: General Purpose Toy fall angles and delivery velocity

2.3 Air Defenses

Currently in the war, the Germans and British have equipped themselves with an early warning radar network which can guide and deploy city defense flak canons as shown in figure 5. These flak canons, though deadlier at lower altitudes, may still reach up to our sleigh's altitude ceiling of 23,000ft MSL [9].

Much of the flak may be mitigated by using additional armor which will be discussed later. Unfortunately, there is the additional threat of Luftwaffe fighter interceptors which can outmaneuver our sleigh and shoot down into our open compartment [10]. This includes the twin engine Me-110 and the Ju-88s. Additional defenses will be required against this threat.

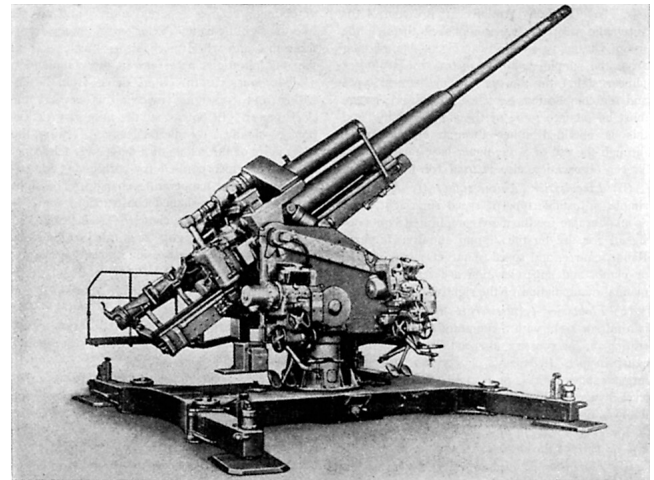


Figure 5: German 12.8cm Flak 40 static Mount Anti-Aircraft Gun

3. Integration

In order to equip my sleigh for European Christmas action we will need to outfit our sleigh with the Norden Bombsight in the front lower compartment, add additional anti-flack armor, and add three defensive guns to repel British and German interceptors.

3.1 Norden Bombsight

A small elf was selected who performed as the best toybadier during initial testing who will sit in the bottom front compartment of the sleigh alongside a Norden Bombsight looking through a reinforced window. The Bombsight was then integrated into the toy release controls and the sleighs automatic pilot to veer the reindeer into the crosswind for further toy drop accuracy.

3.2 Sleigh Armor

The issue of sleigh survivability was first studied following the deadly Christmas toy delivery of 1941 last year. Due to my curse, if I am ever killed in action, I am awoken with a new body shortly following my death and remembering everything so that I don't make the same mistake again [11]. Typically, dogs are my biggest problem [12]. We lost a lot of sleighs that year to the guns, but some did fly back home for refueling and repair. The flak damage recorded from the

surviving sleighs can be seen in figure 6 [13].

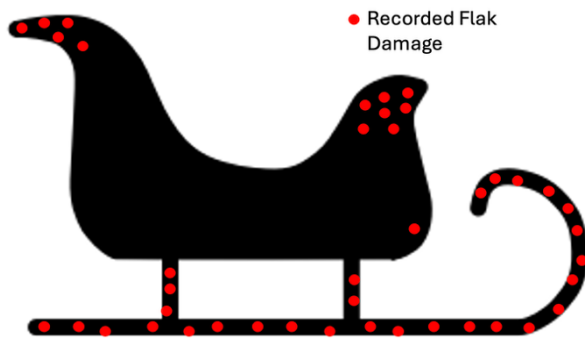


Figure 6: Recorded Sleigh Damage 1941

At first, we decided to reinforce the areas harder hit by the flak damage but then realized that it was actually the areas where we didn't record the flak damage that required the most armor due to the survivorship bias. It was the sleighs shot in the middle compartment and just above the Christmas powered anti-gravity device that didn't make it back. We didn't require any additional armor at the very front and back top or the skids which were rarely needed in flight.

3.3 Defensive Guns

Next, we equipped the sleigh with three elf-manned mounted machine guns to deter any German or British interceptors. In order to cover all vulnerabilities of the sled we needed a rear gunner, a forward gunner and a ball-turret gunner to cover interceptors flying from below the sleigh. We attempted to set the forward gunner atop some of our reindeer, but their legs weren't muscular enough to hold on and fire a loaded weapon without falling off to their doom. The ball-turret gunner may be only marginally safer. Ideally, the skids will hold true on landing otherwise, they may be crushed to death if the escape hatch is jammed.

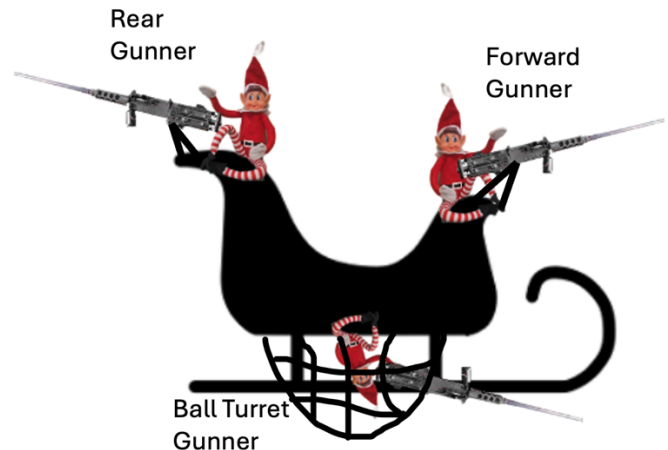


Figure 7: Defensive Guns

3.4 North Pole Proving Grounds

The Norden Bombsight was extensively calibrated in our test range known as the North Pole Proving Grounds at 63° W 88.7° N [14]. We created several test villages and five different standardized GP Toy sizes at 5lbs, 10lbs, 20lbs, 50lbs, and 500lbs. After repeat testing, we were able to calibrate our Mk XV Bombsights to each toy to be live adjusted per present, altitude and sleigh velocity on Christmas Eve. Although many of our drops did not have the Circular Error Probability (CEP) of a pickle barrel as advertised, we expect the intense conditions of wartime flight to focus our elf toybadiers.

4. Implementation

Dropping toys above a contested airspace is not as easy as dropping them over a test range. Primarily there is the trade-off of flying daytime or nighttime Christmas toy delivery sorties. At night, it is much safer due to the air defenses lack of visibility; also, it is tradition. Nighttime delivery was traditionally required for my own personal safety when making a B&E. Because we're dropping them from above that is no longer a requirement. Unfortunately for a nighttime plan, our elves can't see the targets during nighttime raids through the sight. Because each GP Toy has to be aimed at a pre-determined chimney and not a general area, we determined that accuracy is too important to fly our Christmas sorties at night.

To make things worse, the flak really spooks our reindeer. This often causes our flight path to be extremely erratic making aiming the Bombsight intensely difficult even for the most talented toybadier. We began flying our daytime sorties at higher altitudes and faster speeds but that appeared to make our toy drops much less accurate. We were also losing a lot of elf gunners and toybadiers. I regenerate but the elves do not. We had to fly even lower if there was cloud cover.

We elected to implement a lower flying straight and level toy box formation where I am in the front of the pack of sleighs and behind me are a formation of 10-15 elf driven sleighs following my lead. With my leadership I hope I could instill courage in my elves to fly the formation without flinching even though many would not come back alive. We picked the best toybadier to drop in my sleigh and the other sleighs would trigger their drop from watching us. Only a handful of elves could figure out how to use this Norden Bombsight and most of them kept breaking down in non-North Pole conditions. The sight was far too finicky to be easily mass produced at the required level of precision.

5. Results

Only 16% of the presents we dropped landed within a 1000ft CEP. We did put everyone's name on the present and 'From Santa' so they might be able to find their true owner but at that accuracy we needed something closer to a 100ft CEP which we only saw 1.2% of the time. Too many kids named Adolf. We kept track of the CEP estimate measured by our global surveillance system and our losses at the differing altitudes at which we flew. The tragic results are shown in table 1.

Altitude	Sleighs Lost	Elves lost	CEP50
1,000	7,263	38,812	475ft
2,000	3,812	17,523	1100ft
5,000	1,923	12,773	3,000ft
20,000	1,523	10,699	10,000ft

Table 1: Toy attrition and CEP by Altitude

The worst news is that 3rd party analysis of our high-altitude strategic toy delivery campaign hardened most adults and children against Christmas [15]. After all of the hardships of war, not receiving a

present or receiving something you don't want will drive down Christmas spirit. Not only did the presents not hit their target but the overall effect seemed to have a negatively desired result in spreading Christmas joy and cheer.

6. Conclusion

Until the war concludes, Christmas is cancelled in Europe. Most of our toy making material has been repurposed for the war effort anyway. We do rely on global supply chains, and they have been vastly upset by this war. It is a sad day, but Santa may only deliver toys to the very few countries who have somehow avoided the devastation of this deadly war. It spreads every day. One more polar sea U-boat attack and we may be dropping something other than presents next year. Germany and especially Hitler is officially on the naughty list.

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