Hive, Queen, and Country

Bombing Rules V0.9

November 14, 2012

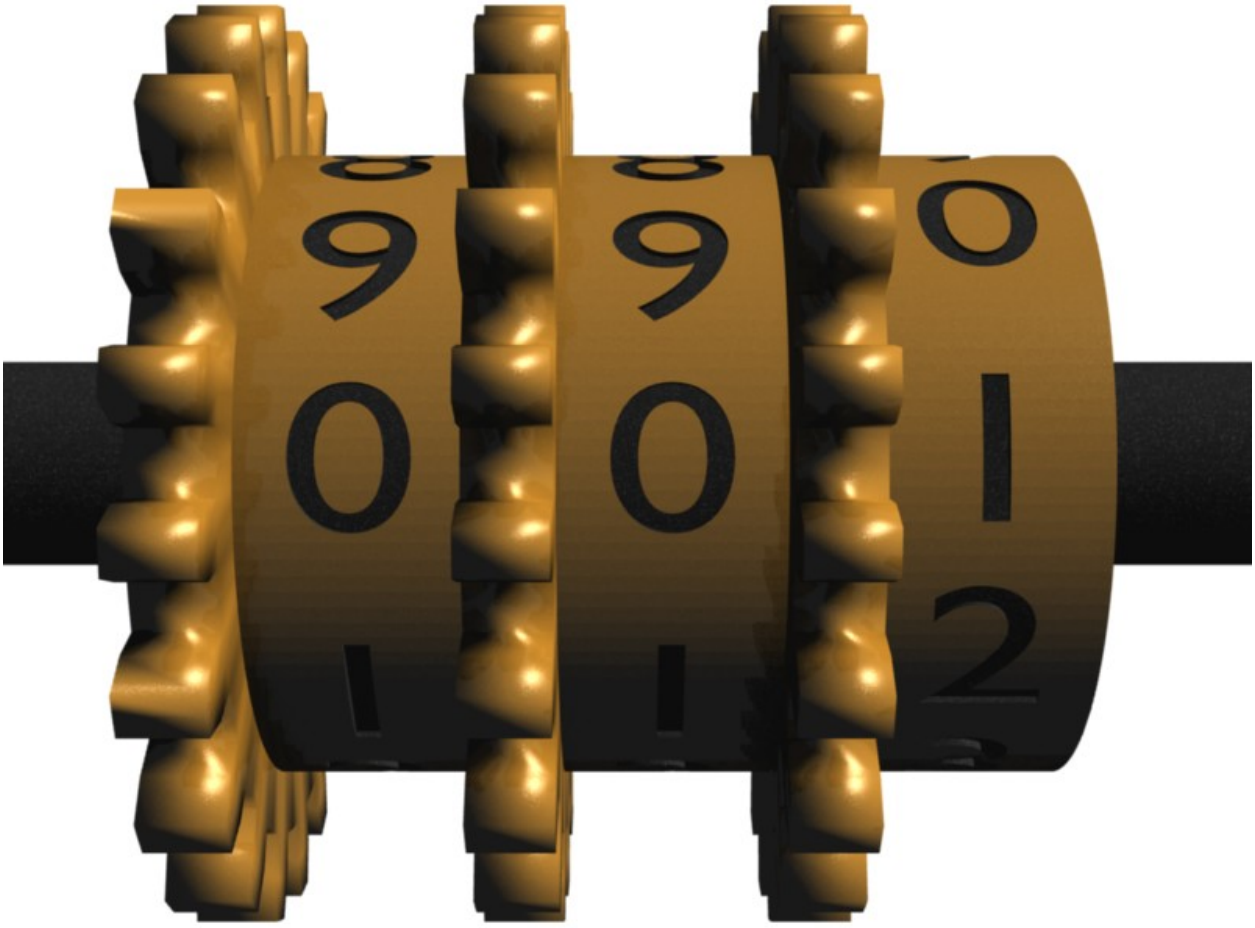
Thanks

Thanks go out to the amazing folks from the Hive, Queen and Country Yahoo! Group. Everyone there contributed but particular mention is deserved by: Alan Hamilton, Michael Fischer, Thomas Barnes, Donald McDonald, Brian Barrett, Phyllis G. Crecelius, David Tanner, Andrew Webb, Paul Mannering, Jon Klement, David Tanner, Gorka Martinez Mezo, Nick Johnston, David Schuey, Mike Creek, Raymond Parks, Dirk Festerling, Grant McKenna and Doug Holverso

Table of Contents

List of Tables

1.Introduction



1.1 What's in this Document

This document is a supplementary text for the Stars of Empire Roleplaying Game [***1***] and *Flying Machines of the Worlds: 1902* source book [***2***], focusing on rules for bombing and air-ground combat in the Hive, Queen, and Country setting. It includes:

- Rules for Low-altitude (within atmosphere) bombing (Section 2)
- Rules High-Altitude (outside of atmosphere) bombing (Section 3)
- Sample statistics for ground targets (Section 4)

1.2 A Note on the Current Date for Players and Referees:

All the Hive, Queen, and Country products are set in an imaginary timeline that diverges from our own in the late 1700s and becomes increasingly different as it moves forward. The original campaigns were set in the years 1891-1893 which were those of the original Hive War, which latterly became known as the First Hive War or Anglo-Hive War. Stars of Empire is explicitly set in the years before 1894. All timelines march forward and that of the HQC Universe is no exception. This book is set in the year 1902, when the Second Hive War is at its peak, and covers many of the flying machines used in that conflict.

The people of Hive, Queen, and Country have been flying since the 1860s, and had mechanical computers since the 1830s. By the 1900s, aircraft have been being designed for 40 years, and computation has advanced the state of the art by another 5-10 years. Thus, the ships of the 1900s are in many ways more advanced than the aircraft of the late 1930s in our timeline (OTL). Unlike OTL, air travel has caught on much more quickly because Aerolyth is so much more effective. Additionally, with space travel being a reality, the people of HQC have discovered some aspects of high-speed aerodynamics. Even though steam engines and internal combustion engines (ICE) are only 10-15 years more advanced than our time line, the aircraft are much more aerodynamic.

1.3 Flying Machines of the Worlds: 1902

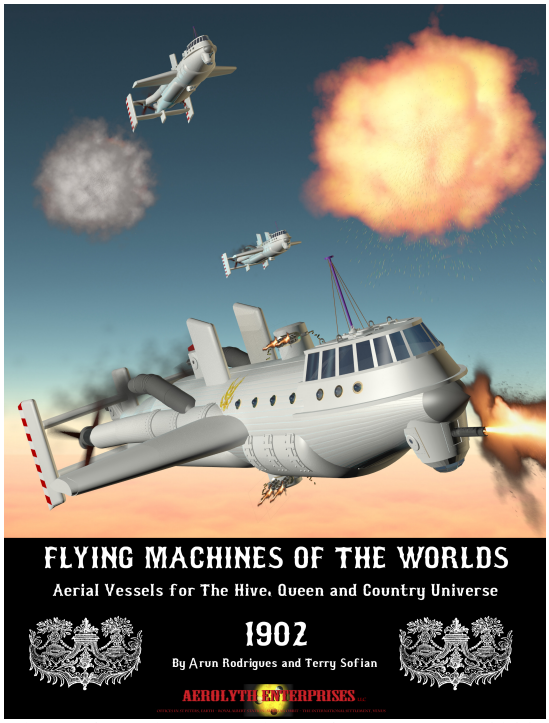


Figure 1: Flying Machines of the Worlds: 1902

This book is a free supplement for *Flying Machines of the Worlds: 1902, a* source book for the Hive, Queen and Country Universe. *Flying Machines* introduces Victorian Science Fiction Roleplayers and War Gamers to the many aerial vessels of that Universe. Whether in the skies of Earth, Mars or Venus these powerful machines provide swift transport or deadly combat capabilities. This volume, heavily illustrated in full color, is modeled on period publications such as Jane's or The Naval Annual; Flying Machines of the Worlds features designs for 111 ships for use in any Steampunk or Victorian Science Fiction setting. In Hive, Queen and Country these are the vessels that patrol the skies of Earth, have fought with the Hives and are now opening the frontiers of Mars and Venus to colonization.

This 256 page full color book includes:

- Details on the aerospace technology and how it can used in a Stars of Empire adventure
- Descriptions of many of the ships which populate the skies of the HQC Universe
- Real World Vehicle Statistics to allow conversion to any combat rules
- Notes on Currency and Unit conversions
- Referee's information on the HQC universe

- A scratchbuiling/kitbashing chapter including detailed directions on how to build your own Shakespeare Class Aerolyth Flyer

Flying Machines is available from:

- **Createspace**: https://www.createspace.com/4015022
- **Amazon**: http://www.amazon.com/Flying-Machines-Worlds-1902-Universe/dp/1480035815/
- **RPGNow**: http://www.rpgnow.com/product/106515/Flying-Machines-of-the-Worlds-1902

A line of miniatures based on the ships from the book are available from:

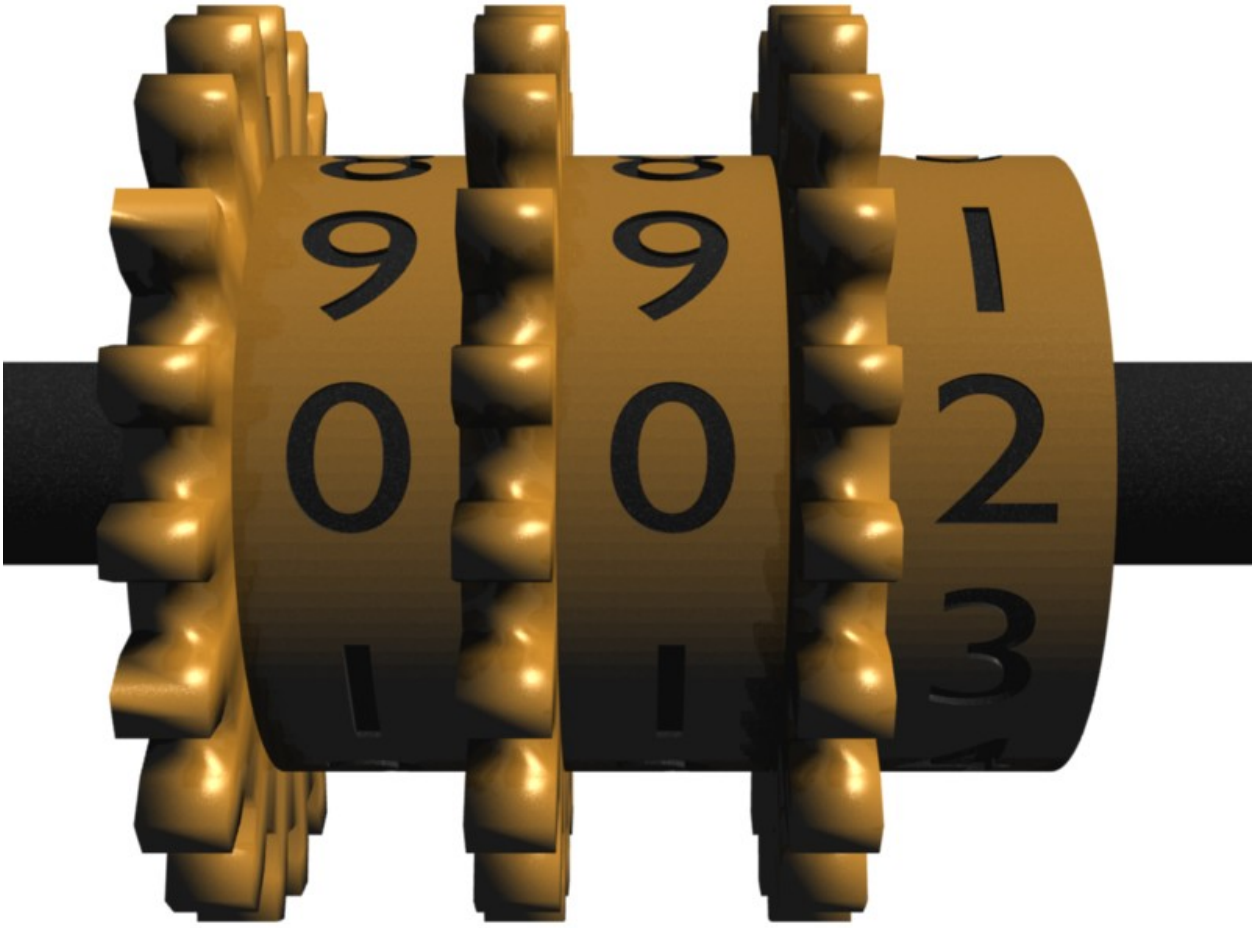
- **Objects May Appear…**: http://www.shapeways.com/shops/objects

1.4 A Note on Roll Modifiers & Rule Systems

These design rules are generally designed to be generic and not tied to a specific set of wargame or role-playing rules. However, some roll modifiers for vehicles are provided which can be used as a guide for conversion to specific game systems. These modifers are based on a d20 system, so, as a rough guide, a +1 is a 5% increase in probability.

Guidelines for calculating damage and penetration values and conversions to other rule systems can be found in the combat and design rules found on http://www.hivequeenandcountry.com/

2.Low-Altitude Bomb Rules



For bombs dropped at altitudes lower than 100km, use these rules.
For bombs dropped from higher altitude, use the High Altitude Rules (Section 3, page 11). The process for resolving bomb drops is:

1. Determine the **base accuracy** of a bomb (in meters) from Table 1.
2. Determine the bomb's offset from the aiming point. This is computed by the following die roll:

   Abs((4d20-41)/39 * **base accuracy** = **offset**
3. Determine the direction of the offset in degrees from North by (1d20-1)*19.
4. Roll for damage based on the bomb type (found in Table 2)

5. If the bomb's penetration (Found in Table 2) is greater than the target's (see the target's Vehicle Design Sheet or Table 4) apply the full amount of damage. If it is less, apply 10% of the damage

Table 1: Bomb Base Accuracy

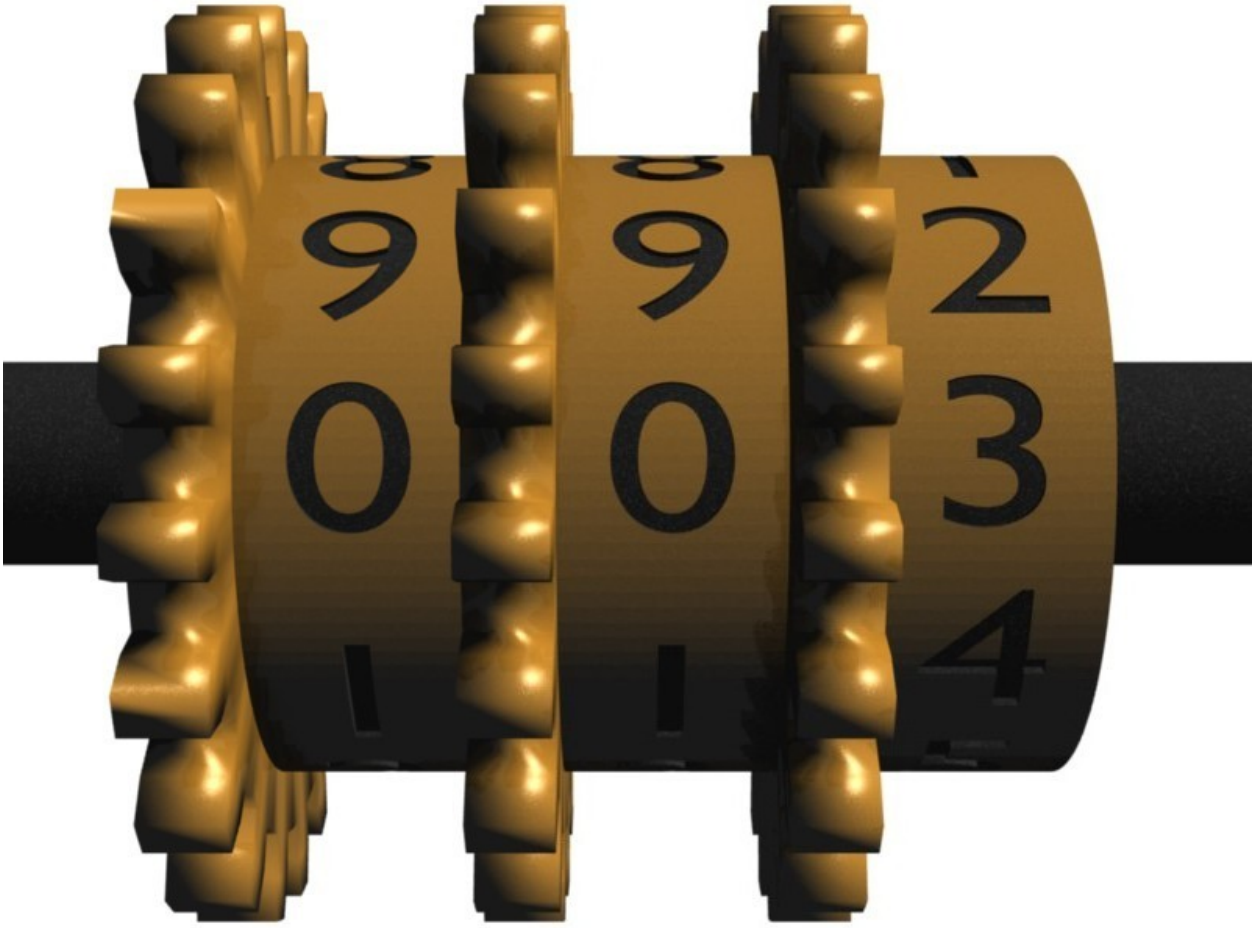
If the Aircraft…	**Base Accuracy** is…
…has a Bombsight	Altitude / 3
…has a Bombsight linked to a computer	Altitude / 4
…does **not** have a bombsight	Altitude / 2
If the Aircraft…	**Base Accuracy** is…
…is traveling slower than 30m/s	* 0.15
…is traveling faster than 30m/s	* 0.5
…is traveling faster than 75m/s	* 1.0

Table 2: Bomb Penetration & Damage

Name	Penetration	Damage
High-Altitude bomb, 10 ton	2854	10d20*200
High-Altitude bomb, 20 ton	3648	10d20*460
High-Altitude bomb, 5500kg	2304	10d20*100
Bomb, 100kg	16	10d20
Bomb, 10kg	7	1d20

Example: A plane flying at 45m/s with a Bombsight drops a 100kg bomb from 3600m.
1. The **base accuracy** is 600m (3600/3*0.5).
2. The plane rolls 36, so the offset is |(36-41)/39*600|=75m
3. The bomb lands (5-1)*19=76 degrees from north

3.High Altitude Bombardment Rules (Kinetic Lances)



Floating at the highest levels Aerolyth can function at, High Altitude bombers can drop bombs with devastating effect. Because the bombs are released well outside of the atmosphere, they gain considerable speed before they are affected by winds. High altitude makes the bombers almost impervious to counterattack or detection, allowing them long periods to observe their target and align themselves for the drop. This can make high altitude bombing surprisingly accurate –

and destructive. The bombs travel at supersonic speed, meaning the target's first indication of the attack is the impact and explosion. So, even if the direct damage of the weapon does not overwhelm the target, the sudden and unexpected nature of the attack is very demoralizing. So effective is this attack mechanism that a special name has been reserved for this type of bomb – the Kinetic Lance.
High Altitude bombs are usually 5-20 tons. They are long, with a conical tip and tapered rear to reduce drag. Some will have small stabilizing fins, although not all do. The bomb will have a thick shell of steel at the tip, to allow better penetration. The explosives are detonated by a delayed impact fuse.

3.1 Process

A high altitude bombing run begins with the bomber rising to about 183km. At this altitude, there is essentially no air, so it must carry its own air supply and use rockets to maneuver. Once at altitude, the ship will accelerate to roughly 300m/s, to match the speed of the Earth below. Usually, this is done using a liquid or solid rocket.
The ship will begin taking measurements with a high-precision celestial navigation system and telescopes to fix its location and velocity. The ship will often use a more precise compressed gas thruster to fine-tune its velocity. More measurements are taken. Aircraft at lower altitude craft may feed information about wind patterns back to the bomber. All of this data (wind, ship velocity, location) is fed into the controlling Babbage machine. Once the master bombardier is confident that a targeting solution has been achieved, the bomb or bombs will be released.
Special low-perturbation release clamps are used to ensure that no spin or other errant motion is imparted to the lance. As soon as it is released, it begins accelerating towards the ground, pulled by gravity and undisturbed by any atmospheric drag.
About 130 seconds later, at roughly 100km above the ground, the bomb is traveling over 1200 m/s and the first wisps of atmosphere begin to touch the bomb, but it continues accelerating.
Around 190 seconds after release, 13km above the ground, the lance starts feeling more atmospheric effects. Crosswinds may begin to nudge the bomb off-course, but only very slightly.
194 seconds after release, the lance is only 6500m above the ground as it reaches its maximum speed – over 1790 m/s. At this point, the thickening atmosphere imparts more drag force on the bomb than gravity's pull. The bomb begins to slow, but only slightly.
198 seconds after release, the bomb impacts. It is traveling at about 1775m/s. The forward surface of the bomb has been heated by the fury of reentry, and is about 300degC hotter than when it began its journey. But, the steel has lost little of its structural strength. Depending on the soil or structure it hits, it will burrow tens of meters into the target. A target with internal voids (e.g. the Hive) may allow the bomb to travel hundreds of meters before it comes to rest. Even a "small" 5.5ton bomb has the kinetic energy equivalent of three tons of gunpowder. This force can excavate a huge crater in the ground. Its fuse is triggered by the force of impact, setting its timer in motion. Once the pre-set time is reached, the explosive payload of the kinetic lance will explode, adding further chaos to the scene.
Once the bomb explodes, observation craft may relay correction info back to bomber so its next attack will be more accurate.

3.2 Rules

The minimum requirements for a High-Altitude bomber are: The Aerolyth panels capable of ascending to 600,000 feet; rockets with a minimum delta-V of 300m/s delta-V; and a Babbage machine. Practically, operations at this altitude will require a life support system and thermal systems. To achieve any sort of accuracy, a high accuracy celestial navigation system and compressed gas rockets are required. Currently, high altitude bombing has only been contemplated against stationary targets.

To determine the effect of a bomb drop:

1. Use Table 3 to determine the **base accuracy** of a bomb (in meters).
2. Determine the bomb's offset from the aiming point. This is computed by the following die roll:

$$\left| \frac{4d20 - 41}{39} * base\ accuracy \right| = offset$$

3. Determine the direction of the offset in degrees from North by (1d20-1)*19.
4. Roll for damage based on the bomb type (found in Table 2)
5. If the bomb's penetration (Found in Table 2) is greater than the target's (see the target's Vehicle Design Sheet or Table 4) apply the full amount of damage. If it is less, apply 10% of the damage

Table 3: High Altitude Bomb Accuracy

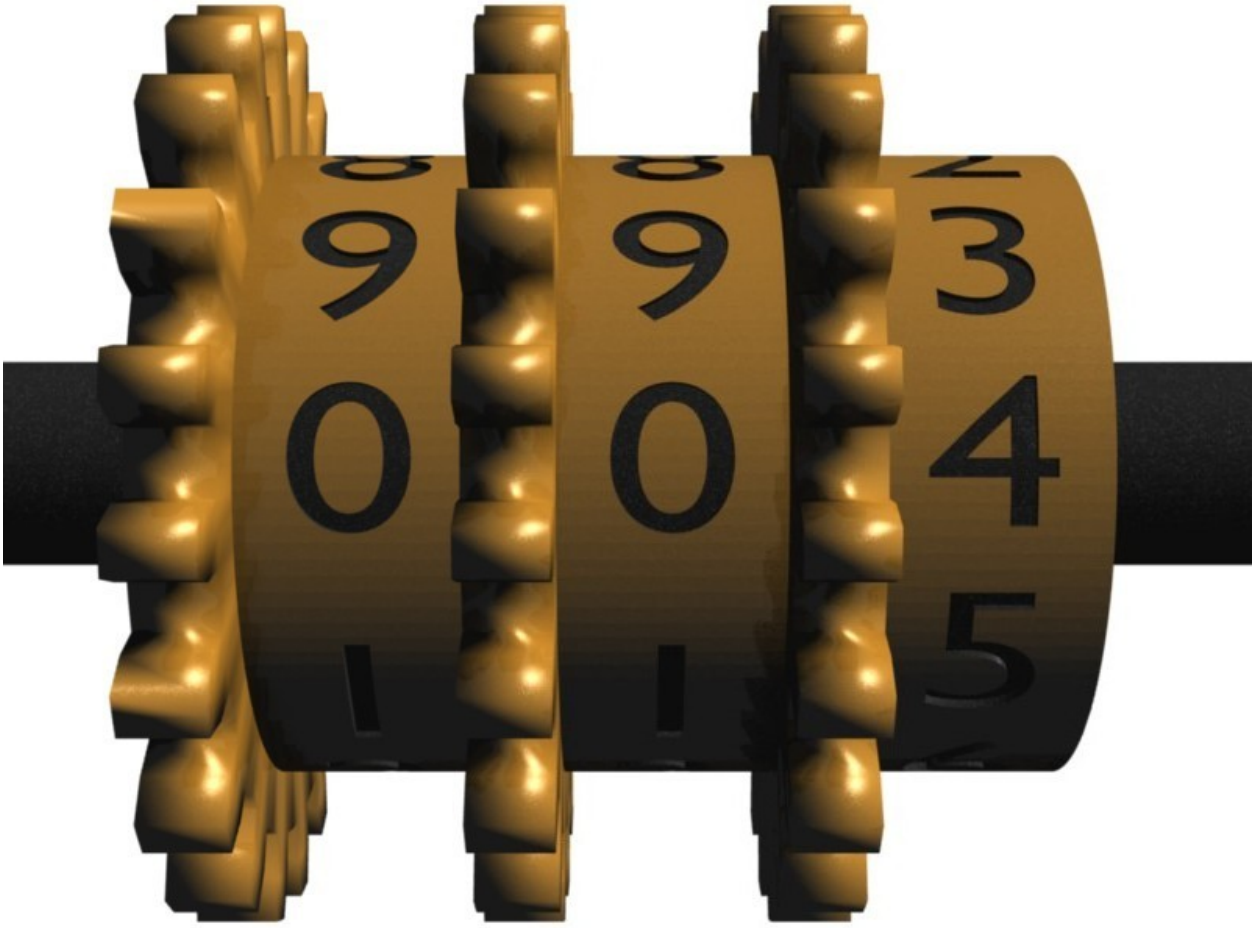
Effect	Condition	Error (m)
Release Error	Standard Bomb Rock	+20
	Low Perturbation Bomb Rack	+5
Atmospheric effects	Target is Calm	+15
	Target is Windy	+20
	Target is Stormy	+25
	Low-Level Weather Observer (max 2)	– 5/observer
Initial Position	No Celestial Navigation System	+20000
	Celestial Nav System	+1000
	Large Celestial Nav System	+800
	V. Large Celestial Nav System	+500
	Target Position is well known	–200
	Plotting Board (Mk II or better)	–50
	Telescope < 0.5m (max 2)	–50/scope
	Telescope >= 0.5m (max 2)	–100/scope
Velocity Error	Liquid or Solid rockets only	+3000
	Liquid or Solid rockets and Compressed gas rockets of at least 30 m/s delta-V	+600
Correction	Per bomb dropped and corrected in last 10 min (because it takes 200 seconds for a bomb to fall, a maximum of 3).	–50/bomb

Example: The Etna (See *Flying Machines of the Worlds: 1902* Section 5.14, page 53) is conducting a bombing attack on the Devon Hive.

1. Calculate the base accuracy. The Gomorrah has a Low Perturbation Bomb Rack (+5). The Target is experiencing Windy Weather (+20) and there are two Low-Level Observers (–5). The ship carries a V. Large Celestial Navigation System (+500), a Plotting Board (–50), and four 1m telescopes (–200 (only two are counted)). The location of the Devon Hive is well known, as it has been extensively surveyed (–200). The ship has both Liquid rockets and compressed gas (+600). This is the first drop, so there are no corrections. The total base accuracy is 670m.
2. The first bomb is dropped. The die roll is 55, so the offset is (55-41)/39*870m = 240m. Because the Devon Hive is several kilometers across, this is a hit.
3. The direction roll is 13, so the bomb's offset is (13-1)*19=228 degrees from North (i.e. to the Southwest)
4. A 10-Ton High Altitude bomb does 10d20*200 damage, or 23600 points in this case.

A spotting craft provides correction information back to the Gomorrah, so the next bomb has a base accuracy of 620m. This next bomb's offset roll is 39, so the offset is (39-41)/39*820=32m – a very accurate hit. The direction is (1-1)*19=0 (due North). Damage is 21400 points.

4.Sample Building & Troop Stats



A complete accounting of land and sea units is beyond the scope of this book. However, some typical values can be seen in Table 4.

Table 4: Sample Land Units, Sea Ships, and Buildings

Type	Hit Points	Armor	Damage	Penetration	Range	Target Mod
100 Unarmored Troops w/ Rifles	20	0	2	8	800	+5
100 Armored Troops w/ Rifles	25	0	2	8	800	+5

Type	Hit Points	Armor	Damage	Penetration	Range	Target Mod
100 Cavalry	60	0	3	8	1000	+5
Walker	14	3	2	9	4200	+3
Armored Car	35	8	2	9	4200	+7
Land Destroyer	190	40	1d20/4+1	96	14300	–3
Land Cruiser	375	50	3d20/2	120	14800	–6
Torpedo Boat (45m)	85	3	2d20	13	6000	+6
Light Cruiser	870	38	6d20	120	14800	–4
Battleship	1260	108	10d20*12	302	19600	–12
Wooden Resi-dential Building (~100 m^2)	3	1				
Stone Building (~200 m^2)	23	4				
Bunker (~300 m^2)	105	35				

Bibliography

[1] Terry N Sofian, *Stars of Empire: A Scientific Romance Set During the Victorian Conquest of Space*. USA: CreateSpace, 2010.

[2] Arun Rodrigues and Terry Sofian, *Flying Machines of the Worlds 1902*.: Createspace, 2012, http://www.amazon.com/Flying-Machines-Worlds-1902-Universe/dp/1480035815.

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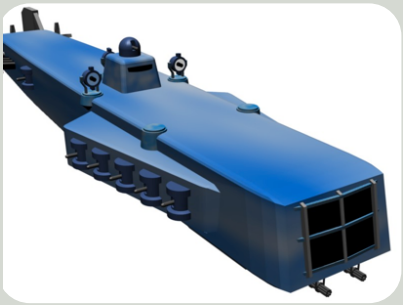

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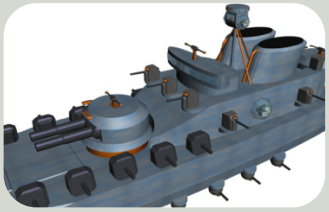

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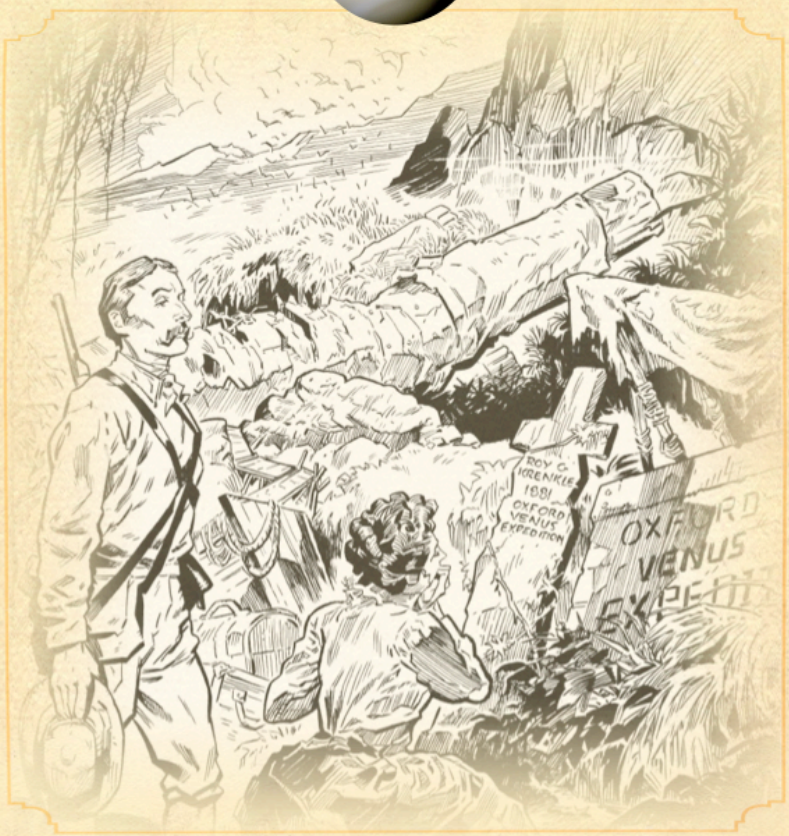

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