# Operant Conditioning

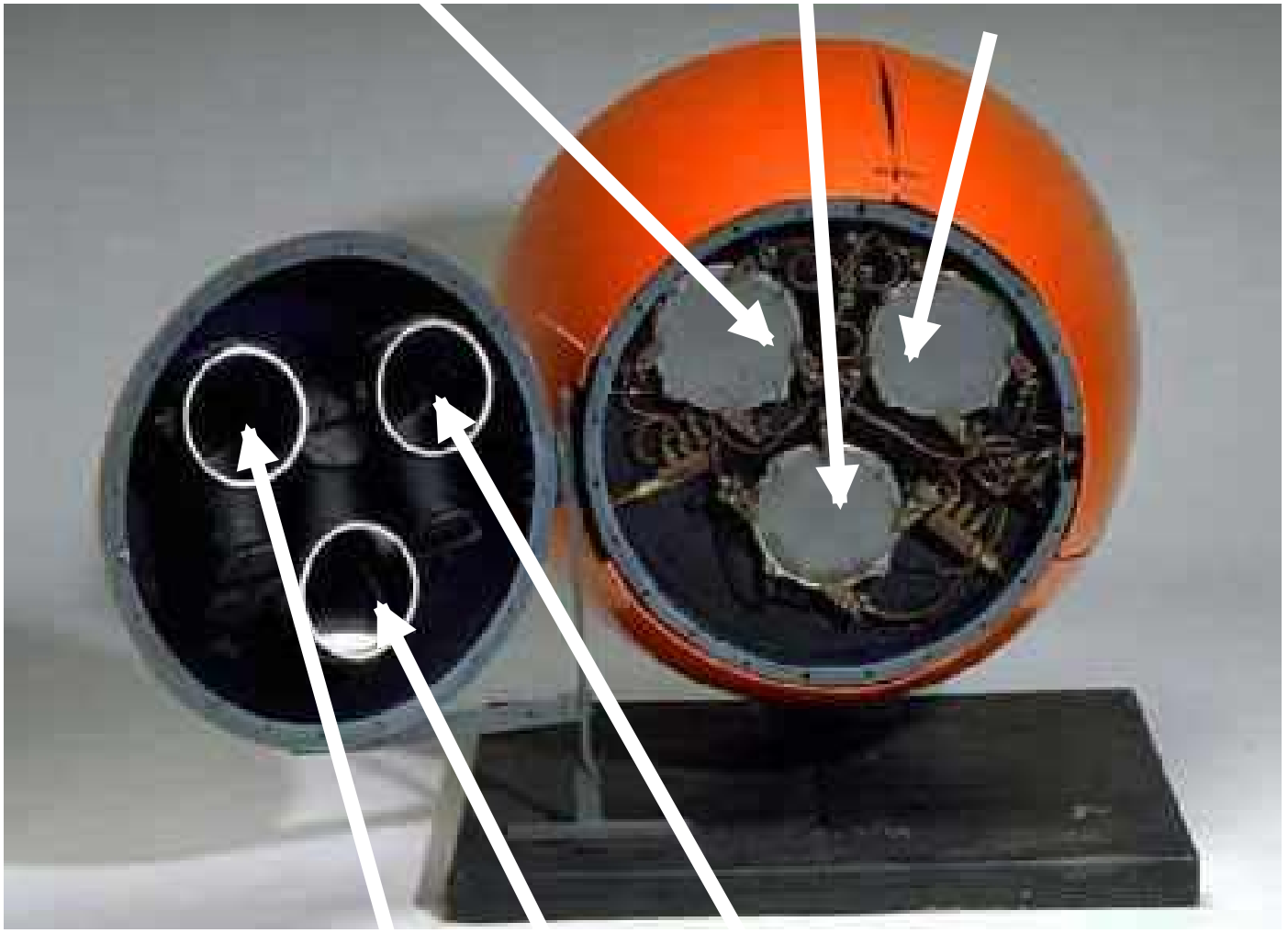
A learning theory that uses POSITIVE REINFORCEMENT, NEGATIVE REINFORCEMENT, and/or PUNISHMENT in order to shape behavior.

- Reinforcer:  anything that increases the occurrence of a desired behavior.
- Positive Reinforcement:  reinforcement by giving something.
- Negative Reinforcement: reinforcement by taking something away (removal)
- Punishment:  anything that decreases the occurrence of an undesired behavior. Usually unpleasant.

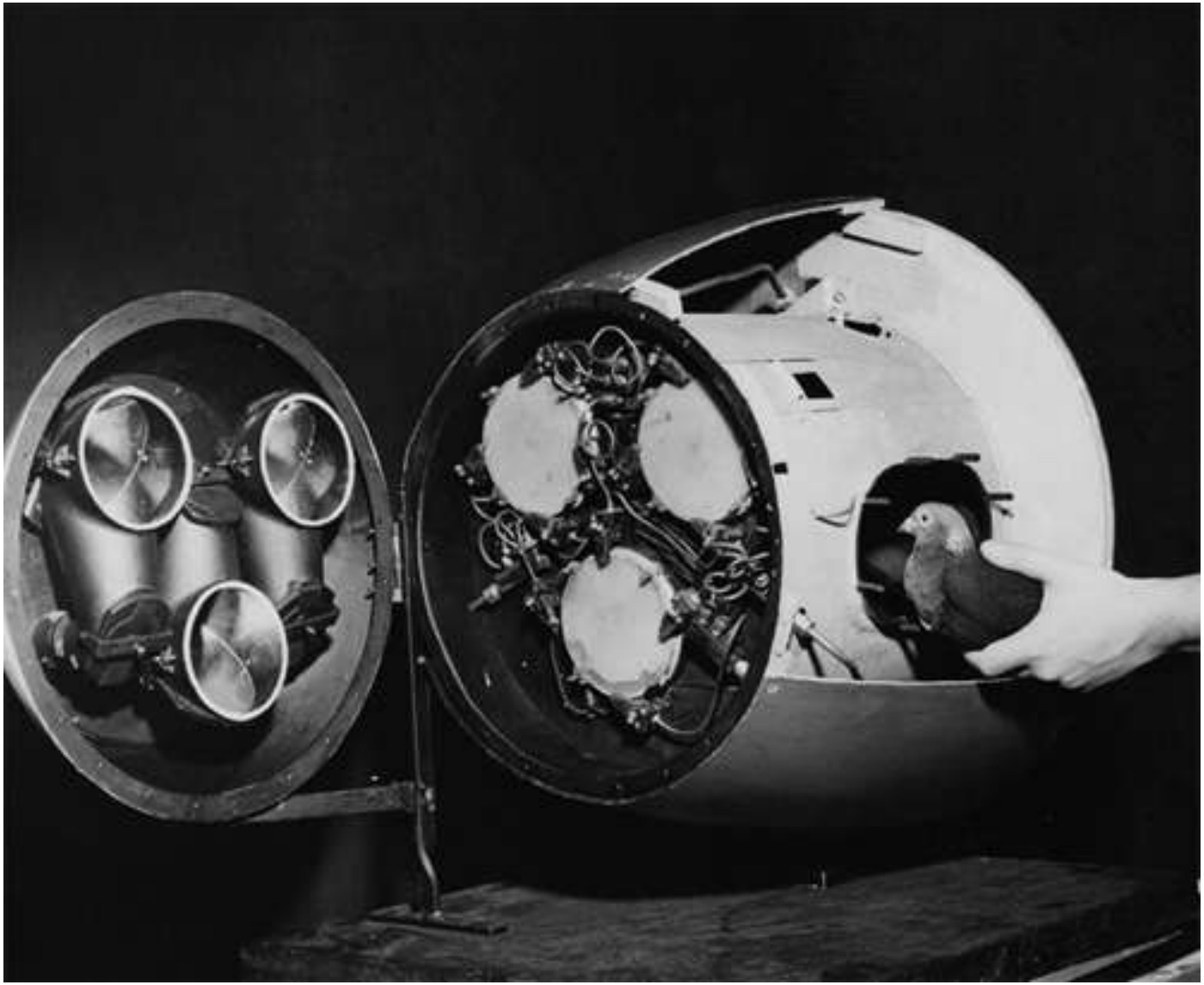
# Practical Application (almost)

- "Project Pigeon" was Skinner's attempt to help defeat Germany during WWII.
- Concept:  a missile, guided by conditioned pigeons, should be able to hit an enemy warship 100% of the time.
  - This works pretty reliably with primary reinforcers.
  - The government sunk $25,000 into this research from 1942-44.
  - The Navy said "No, thanks."

Three pigeons controlled the three flight axes of the missile. A 2/3 pigeon majority was required for course changes.

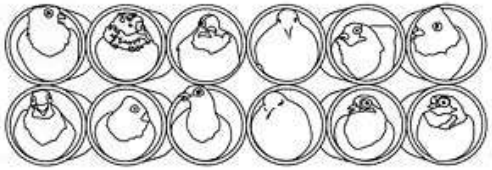


Lenses showed the target to the pigeons.



## Project Pigeon

Project Pigeon was a classified research-and-development program during World War II. It was developed at a time when electronic guidance systems did not exist, and the only compensation for the inaccuracy of bombs was dropping them in quantity. This ingenious application of shaping would have dramatically increased the accuracy of bombs and decreased civilian casualties. Despite favorable performance tests, however, the National Defense Research Committee ended the project—it seems they couldn't get over the idea that pigeons would be guiding their bombs.



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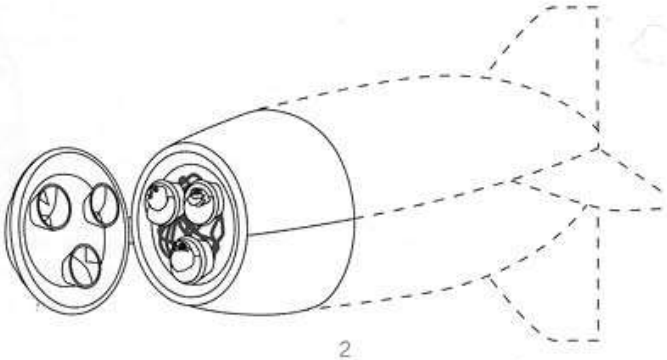

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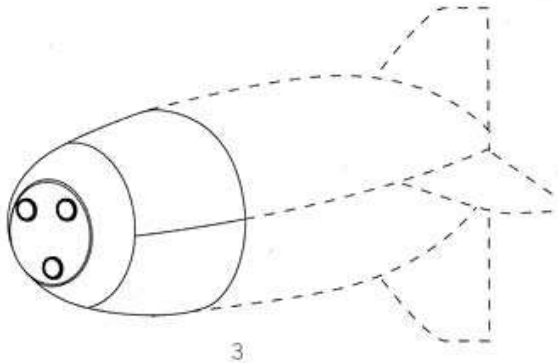
1. Pigeons were trained to peck at targets on aerial photographs. Once a certain level of proficiency was obtained, pigeons were jacketed and mounted inside tubes.

2. The pigeons in their tubes were inserted into the nosecone of the bomb. Each nosecone used three pigeons in a type of voting system, whereby the pigeon pecks of two birds in agreement would overrule the errant pigeon pecks of a single bird.

3. Sealed in the bomb, the pigeons could see through glass lenses in the nosecone.

4. Once the bomb was released, the pigeons would begin pecking at their view of the target. Their pecks shifted the glass lens off-center, which adjusted the bomb's tail surfaces and, correspondingly, its trajectory.



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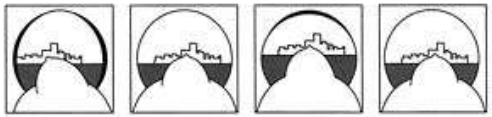

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