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CASIMIR COQUILHAT'S THEORY ON ROCKET MOTION - THE ROCKET EQUATION
ESTABLISHED IN 1871!

Abstract

In the course of research on early rocketry, a so far nearly unknown name cropped up only a few weeks ago, that of Belgian artillery general Casimir Coquilhat (1811-1890). A former director of the Antwerp arsenal, he actually wrote on 11 April 1871 a note entitled "Trajectoire des fusées volantes dans le vide - Trajectory of flying rockets in vacuum". Mainly dedicated to war rockets use, it was published two years later in "Mémoires de la Société Royale des Sciences de Liège", a learnt society he belonged to.

In this impressive 33 pages work, Casimir Coquilhat analysed the general motion of two kinds of war rockets, with and without lateral stick, for any launch angle and at any given time. In the second case, the simplest one, for an horizontal launch neglecting the effects of gravity, he established on page 13, among others, the following value for the velocity of a rocket:

$v = F/m \log (M/M\text{-}mt)$

with F = thrust, m = mass flow rate, M = initial mass and t = time.

Thus, the famous rocket equation established by Tsiolkovsky on 10 May 1897 already had been found a full 26 years before, by Belgian Coquilhat, a rather stupendous discovery!

This paper analyses Casimir Coquilhat's fascinating theoretical work on the motion of a rocket, seemingly the most advanced one at the end of XIXth century, a major step before Tsiolkovsky and Esnault-Pelterie. It also will provide his biography.