Over 50 years ago, it was predicted that it is possible to split an atom with a neutrino interaction, but there has never been a concerted experimental effort to confirm this phenomenon. The existence of this process would inform nuclear astrophysics, nuclear reactor monitoring and give a vantage into a process that bridges both the weak and strong fundamental interactions. This too would add the neutrino, the most elusive particle in the universe, to the selective group of particles confirmed to induce nuclear fission. To that end, the NuThor Detector was built in 2022 as a dedicated neutrino-induced nuclear fission (hereafter referred to as “nuFission”) detector on thorium. The NuThor Detector hermetically seals 52.0 kgs of thorium metal inside a novel, custom-made neutron multiplicity meter built to efficiently capture and detect fission neutrons peeled off of the fissioned thorium nuclei. Said neutron multiplicity meter is composed of gadolinium-doped water to moderate and capture the aforementioned neutrons. Then an array of 7.7 kg NaI[Tl] scintillator crystals from the Homeland Security Advanced Portal Program are affixed all around the complex of thorium and Gd-Water to detect neutron-capture gamma rays. This entire apparatus is exposed to the intense neutrino flux of the Spallation Neutron Source (SNS) at Oak Ridge National Laboratory. The immense, pulsed neutrino source is coupled with the seasoned neutrino experimenters of the COHERENT collaboration to present a unique and promising opportunity to conclusively put this half century mystery of nuFission to rest. This work reports the design, deployment and sensitivity of the NuThor detector.