In this paper, we consider the problem of multi-parameter estimation in the presence of compound Gaussian clutter for cognitive radar by the variational Bayesian method. The advantage of variational Bayesian is that the estimation of multi-variate parameters is decomposed to problems of estimation of univariate parameters by variational approximation, thus enabling analytically tractable approximate posterior densities in complex statistical models consisting of observed data, unknown parameters, and hidden variables. We derive the asymptotic Bayesian Cramer-Rao bounds and demonstrate by numerical simulations that the proposed approach leads to improved estimation accuracy than the expectation maximization method and the exact Bayesian method in the case of non-Gaussian nonlinear signal models and small data sample size.