This model proposes a CNN-LSTM algorithm that combines the advantages of both Convolutional Neural Networks and Long-Short Term Memory cells to predict the expected replacement of serviceable parts of an aircraft within a stipulated time window to determine the optimal stock to be maintained at a station. Adding convolutional layers to capture local, temporal patterns on top of LSTM layers can be immensely helpful. An Nadam optimizer-based CNN-LSTM prediction model for Inventory Demand Forecasting is proposed. The accuracy of NSGA optimizer-based CNN-LSTM is greatly enhanced than the traditional LSTM model. The life of serviceable parts is predicted using parameters such as aircraft type, time of arrival, different airports, the weather temperature variations, runway quality at the station.