An original RF design approach for the realization of fully reconfigurable planar multiband bandstop filters (BSFs) is reported. The engineered RF filtering topology allows independent control of its stopbands in terms of center frequency and bandwidth. It exploits the in-series cascade of K spectrally agile N-notch filtering cells that are connected through K - 1 static impedance inverters to realize an N-band filtering transfer function with Kth-order stopbands. Each of these multinotch cells is formed by N tunable resonators-center-frequency control-that interact with the same nonresonating node by means of different variable couplings-bandwidth control. Additional features of this tune-all multiband BSF architecture when compared with related prior-art devices are: 1) scalability to the synthesis of an arbitrary number of stopbands; 2) notch-spectral-merging capability into wider eliminated bands of the same order, which equivalently allows the intrinsic control, i.e., without RF switches, of the amount of active rejected bands; and 3) smaller physical size. The coupling-matrix modeling of the conceived multiband BSF scheme is presented. Moreover, its cointegration with other RF analog-processing actions in multifunctional components, such as bandpass filtering and power division, is investigated. For experimental-validation purposes, three UHF-band mechanically reconfigurable microstrip prototypes are developed and tested. They correspond to a dual-notch filter, a wideband bandpass filter with embedded notches in its tunable passband, and a Wilkinson-type power divider with inserted stopbands for dynamic multi-interference mitigation.