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An affine pseudo-plane X is a smooth affine surface defined over \mathbb{C} which is endowed with an \mathbb{A}^1 -fibration such that every fiber is irreducible and only one fiber is a multiple fiber. If there is a hyperbolic G_m -action on X and X is an ML_1 -surface, we shall show that the universal covering \tilde{X} is isomorphic to an affine hypersurface $x^r y = z^d - 1$ in the affine 3-space \mathbb{A}^3 and X is the quotient of \tilde{X} by the cyclic group $\mathbb{Z}/d\mathbb{Z}$ via the action $(x, y, z) \mapsto (\zeta x, \zeta^{-r} y, \zeta^a z)$, where $r \geq 2, d \geq 2, 0 < a < d$ and $\gcd(a, d) = 1$. It is also shown that a \mathbb{Q} -homology plane X with $\bar{\kappa}(X) = -\infty$ and a non-trivial G_m -action is an affine pseudo-plane. The automorphism group $\text{Aut}(X)$ is determined in the last section.