Security dangers of the NIST curves

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The NIST curves were designed to make DLP difficult.

Or were they?
“ECC Brainpool Standard Curves and Curve Generation version 1.0”, 2005.10.19: “The choice of the seeds from which the curve parameters have been derived is not motivated leaving an essential part of the security analysis open.”
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Bruce Schneier, “NSA surveillance: A guide to staying secure”, The Guardian, 2013.09.06: “Prefer conventional discrete-log-based systems over elliptic-curve systems; the latter have constants that the NSA influences when they can.”
But that’s not our main point. As far as we know today, NIST-curve DLP is secure.
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Here’s our main point: **NIST-curve ECC is much less secure than NIST-curve DLP.**
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Here’s our main point: NIST-curve ECC is much less secure than NIST-curve DLP.

If you use the NIST curves, you’re probably doing it wrong.

Your code produces incorrect results for some rare curve points; leaks secret data when the input isn’t a curve point; leaks secret data through cache timing; etc.
These problems are exploitable by attackers.

These attacks are against real protocols, not against DLP.

DLP is non-interactive; computes $nP$ correctly; reveals only $nP$.

Real protocols handle attacker-controlled input; have failure cases; reveal timing.

Attacker exploits these gaps.
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Sensible security engineering: Design curves for ECC security, not just for DLP security.
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Detailed analysis online now (+ white paper coming soon): [cr.yp.to/talks/2013.05.31/slides-dan+tanja-20130531-4x3.pdf](cr.yp.to/talks/2013.05.31/slides-dan+tanja-20130531-4x3.pdf)
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⇒ Use Curve25519.
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⇒ Use Curve25519. Or \( x^2 + y^2 = 1 + 3617x^2y^2 \mod 2^{414} - 17. \)