



## (S//SI) Nuclear Sleuthing -- Can SIGINT Help?

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*(S//SI) Can SIGINT help shed light on the existence of centrifuges used to enrich uranium? A topic of discussion for the new SIDtoday blog:*

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(U) Uranium enrichment for weaponization is much in the news these days; rogue states like Iran and North Korea are strongly suspected of either working on, or already possessing such technologies. Of course, all nations in the nuclear arms club mastered enrichment years ago, while others -- Japan and Argentina for example -- did so only for research, propulsion, or energy needs.

(U) Of the half-dozen operational methods of extracting the precious U<sub>235</sub> isotope (the so-called initiator of a nuclear chain reaction) cascades of centrifuges spinning at high rates are the most widespread. Even the commercial entity URENCO operates large-scale plants for this purpose in the UK (Capenhurst), the Netherlands (Almelo), and Germany (Gronau); see images below.



(S) Now, the very spinning of a uranium centrifuge produces a distinct acoustical signature, and some years ago the Russians curiously permitted videotaping inside their primary enrichment facility at Novouralsk; see image below (tape courtesy of our colleagues at CIA).



(S//SI) Digitization of the audio component allowed spectral analysis of the site's acoustical environment while the centrifuge cascade was operational. The spectral images below make evident a main peak at 1,398 Hz -- indicative of a spin rate of some 84,000 rpm -- and its first harmonic (i.e., frequency double) at 2,796 Hz.



(S//SI) The spin rates are highly stable in time -- required to ensure consistent isotope separation -- so acoustical stability over several minutes is a sensible indicator of the presence of a centrifuge. Unfortunately, as the spectral images make abundantly clear, other acoustical sources are unavoidably mixed in, making unequivocal fingerprinting problematic.

(TS//SI) Where does SIGINT fit in? We could conceivably collect acoustical signatures that can be heard - along with the voice - on telephone intercepts from inside the facility. However, the person making the call would have to be located inside, or at least near, the centrifuge compound for the acoustical signature to be audible. Yes, a needle in a haystack! Still, algorithms have been developed and deployed in the S2/BABBLEQUEST processing architecture looking for just such signatures; however, no convincing evidence has been found so far.

(S//SI) To minimize false alarms and build confidence in SIGINT's ability to detect and identify such acoustic signatures, **the Intelligence Community (IC) would need to know the operating spin rates for all known centrifuge cascades at foreign uranium enrichment facilities; even better would be acoustical recordings. How to get them?**

(S//SI) I would like to get a dialogue started on how the IC could best proceed in this matter. Is there any feasible way of obtaining such recordings from all known centrifuge-based U<sub>235</sub>

enrichment facilities, whether knowingly provided by governments\*\* or otherwise? If you have thoughts on this matter, please post your comments on the *SID today* blog. Here's the link:

[SID today blog](#)

(A link to the blog is also placed on the right side of the *SID today* homepage.)

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\*\**(U//FOUO)* Note: States/entities known to possess centrifuge-based U<sub>235</sub> enrichment technology (as of 2000) are: US, UK, Russia, China, India, Pakistan, Germany, Japan, The Netherlands, Brazil, South Africa, URENCO. Source: DOE, K/NSP-121/Part 5.

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