

AFRL RESEARCH TOPIC CALL FOR FY13

ATTACHMENT 1

1. **Research Title:** "Printed and Flexible Electronics for USAF Sensor Applications"
2. **Individual Sponsor:**
Dr. Carrie M. Bartsch, AFRL/Rydd
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3. **Academic Area/Field and Education Level:** Electrical Engineering, Materials Science, Chemistry / Additive Manufacturing of Printed Electronics (MS or Ph.D. level)
4. **Objectives:** The goals of this research project are to utilize new and non-traditional fabrication techniques for creation of photonics, electronics, and opto-electronics (including packaging, interconnects, waveguides, and antenna structures) for sensor applications. Here, we intend to first explore the current state-of-the art in capability utilizing existing materials (consumer off the shelf, or "COTS" inks and supplies) to both create sensor structures, and then analyze their performance against commonly produced and deployed counterparts (for example, III-V foundry fabrications of sensor structures). Latter phases of the research will attempt improving the input materials (e.g. better inks) and fabrication processes (higher resolution deposition, new methods of sintering, or fabrication on flexible or nonplanar substrates) to improve these initial results. Areas of emphasis include infrared sensing, electrically- or optically-pumped lasers, passive/active waveguiding and routing structures, and elements for building radiofrequency (RF) transceivers.
5. **Description:** This proposed project will explore the recent flourish of tools and processes that have been developed for 2-D and 3-D prototype manufacturing, such as ink jet printing, aerosol jet printing, nano-imprint lithography, and other similar techniques to make large area, substrate agnostic electronic and photonic components. Initial efforts will focus on creation and test of "standard" structures from the literature, and then attempt to increase performance via improved materials and fabrication techniques. It is anticipated that a multi-disciplinary academic background, drawing primarily from electrical engineering, materials science, and chemistry, will be required to graduate level research success.
6. **Research Classification/Restrictions:** The research performed on this project is mostly anticipated to be fundamental in nature, with no inherent publication or presentation restrictions. There may be aspects of requirements analysis or comparison to state-of-the-art devices and components that are deemed FOUO and have public release or ITAR restrictions.
7. **Eligible Research Institutions:** Place an X in all that apply.
 Universities (DAGSI) AFIT (only) USAFA
8. **Interest in Summer USAFA Cadet (Avg Cost for USAF Cadet for 33 days was \$5000):**
If we have the funds, yes.