The ruby laser beam is in the red end of the visible spectrum but the extremely short time duration—a millisecond—and the narrow beam makes it invisible to all except those looking directly either at the target or the source. The use of a neodymium doped glass rod can be fully covert since its burst is in the invisible part of the spectrum.

Experiments were conducted with a portable 2 joule ruby laser with associated mirrors, filters, and optics. A variety of subjects ranging from 250 foot slant range to 5000 foot slant range were recorded on 70 mm film using a conventional camera. Weather conditions varied from clear nights with a light ground haze to rain showers with fog and snow showers. Films were evaluated for optimum sensitivity, contrast, and resolution to the 6943-angstrom wavelength energy.

Very successful, high resolution, photographs were obtained. Data regarding the optimum film types for use with laser beams have been developed as well as the film processing details. Means of using optics to improve the photographic quality without excessively destroying the narrow characteristics of the laser have been evolved.

Radio frequency (RF) probe

During an in-house investigation of various means, electrical and mechanical, of detecting intermittent faults in equipment, Air Force Aeropropulsion Laboratory engineers noted that, characteristically, all faulty electronic equipment produced a 24KC nose signal.

Using Laboratory Director's funds, a portable, self-contained probe capable of pinpointing this signal was developed and subsequently field tested by the using commands. The field testing has been extremely successful, and procurement data for the RF–204/u Detector, Radio Frequency Interference, was forwarded to the Air Force Logistics Command.

Quick fix applied to F–100 IFF radar antenna problem

A quick-fix to a critical Air Force problem in Vietnam was researched and successfully developed in-house by the Air Force Materials Laboraory. IFF radar antennae on the F–100 were failing after about six hours of aircraft operation from acoustical vibration generated by the plane's own cannon fire. Air Force Materials Laboratory scientists simulated the service failure in the laboratory, and developed a small, low cost, easily attachable prototype viscoelastic damper as a quick-fix. Field evaluation of the damper in Vietnam showed a twelve-fold increase in the life of the radar antennae. A sufficient number of dampers manufactured in-house by Air Force Materials Laboratory personnel were shipped to completely fit the F–100 fleet in Vietnam.

Nitroso terpolymer

The deterioration of elastomeric seals, hose and fluid container linings in contact with nitrogen tetroxide (a high performance oxidizer used in liquid rocket propulsion systems) has posed a difficult problem for which a solution has been sought for several years with little previous success. The Air Force Materials Laboratory effort has resulted in a major materials breakthrough in the development of an elastomeric material resistant to nitrogen tetroxide. This newly developed material is a nitroso terpolymer (nitroso rubber). In evaluation tests this material has remained intact after total immersion testing in liquid nitrogen tetroxide for 1½ years at 165°F, and is expected to be good indefinitely at 100°F. Under these test conditions, the best commercially available material (a butyl rubber) lasts only 1 hour at 165°F and 7 days at 100°F before it deteriorates. The nitroso terpolymer has passed hardware evaluation tests and has been qualified for use on the Apollo. Because the nitroso terpolymer will not burn in air of oxygen, this material also has other potential uses such as fireproof protective clothing or, since the nitroso terpolymer can also be made in liquid form, as a sprayed-on fireproof coating for spacecraft interiors.

Supersonic turbojet engine study

The Air Force Aeropropulsion Laboratory has completed a study effort on a new turbine engine concept—a supersonic combustion non lift type turbojet engine.

The study results showed the following: (a) Ratio of engine thrust to installed engine weight (F_n/W_t) of 10.2—nearly three times present installations, (b) Installed engine length reduced by about 60% and (c) Installed engine weights reduced by 50%. A further accomplishment of considerable merit is the combination of all rotating compressor and turbine stages in one wheel.