the pattern at rest. Arterial-coronary sinus difference in oxygen content increased with exercise and was significantly correlated with heart rate. Myocardial extractions of FFA, glucose, and pyruvate, but not lactate, were significantly correlated with their respective arterial concentrations at rest. During prolonged exercise myocardial extractions of pyruvate and lactate, but not FFA and glucose, were correlated with their arterial concentrations. (Author)

92—Work Capacity and Physiologic Responses to Work—Men Born in 1913. G. GRIMBY, J. BJURE, M. AURELL, B. EKSTROM-JODAL, G. TIBBLIN, and L. WILHELMSEN (Goteborg, University, Goteborg, Sweden). *American Journal of Cardiology*, vol. 30, July 11, 1972, p. 37-42. 18 refs.

Results of a maximal exercise test performed by a group of 793 54-yr-old men. The purpose was to increase the basic data of a prospective study of ischemic heart disease and other pathological conditions, to study cross-sectionally the physical performance of the population (the occurrence of anginal pain and electrocardiographic anomalies at standardized work loads, comparing these data to other relevant data in the population), and to collect randomly selected control material for comparing groups with different diseases, e.g., patients with myocardial infarction. The study appears to show that a high percentage of 54-yr-old men can perform maximal exercise without demonstrable evidence of increased probability of cardiovascular hazards.

93—Aural Glide Scope Cues: Their Effect on Pilot Performance during In-Flight Simulated ILS Instrument Approaches. A. H. HASBROOK and P. G. RASMUSSEN. FAA Civil Aeromedical Institute, Oklahoma City, Okl., May 1971. 24 pp. Report No. FAA-AM-71-24.

Forty instrument rated Commercial and ATR pilots with 250 to 12,271 flight hours each flew ten simulated ILS approaches in a single engine, general aviation aircraft. Divided into five groups, each group used a different glide slope cue display in combination with a modified "T" instrument panel configuration. Two types of aural glide slope cue displays were utilized: (1) voice, and (2) Morse code signals. No significant differences were found among the five groups relative to accuracy in glide slope tracking. There was no apparent improvement with practice. The presence of aural glide slope cues resulted in the aircraft being flown slightly higher across the middle marker than when only the conventional visual display was utilized. Localizer performance showed a slight but significant initial decrease in the presence of aural glide slope cues with respect to only one performance measure. This difference was minimized as a function of the number of approaches flown. No significant differences appeared among groups with regard to stress levels as measured by heart rate and heart rate changes. Mean heart rates declined over successive approaches but increased during each approach. Transition from the conventional visual cross-pointer display to the aural (voice) glide slope cues was achieved with a minimum of familiarization and with no apparent difficulty.

94—The Function of External Respiration in Mental Activity (Funktsiia zovnishn'ogo dikhannia pri rozumovii diial'nosti). S. M. RASHMAN (Kiivs'kii Pedagogichnii Institut, Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal*, vol. 18, May-June 1972, p. 361-366. 12 refs. In Ukrainian.

Investigation of the changes affecting the external respiration and cardiovascular systems during intense mental activity (namely, problem solution in mathematical analysis). Data are reviewed on: changes in arterial blood saturation by oxygen; respiratory frequency, capacity, and minute volume; oxygen consumption and intake coefficient; ventilation equivalent; and a number of psycho-physiological indices characterizing the state of cortical processes during intense mental activity.

95—Lung Volume of People Staying in Antiorthostatic Position under Application of Various Prophylactics (Legochnye ob'emy pri prebyvanii liudei v antiortostaticheskom polozhenii s primeneniem razlichnykh sredstv profilaktiki). B. S. KATKOVSKII and V. A. ANDRETSOV. *Kosmicheskaia Biologiia i Meditsina*, vol. 6, July-Aug. 1972, p. 55-59. 8 refs. In Russian.

In a 30-day bed experiment, changes in total lung capacity and other lung volume variables were studied upon three groups of three test subjects each, in hospital beds whose lower (i.e., foot) ends were raised to a 4-deg angle above the horizontal. The first group performed physical exercises in bed, the second represented the control group, and the third underwent electric muscle stimulation. A varying extent of initial lung volume decline was observed in all three groups. In the first, this decline endured to the end of the experiment. In the second and third groups, the pretest lung volume was restored and then exceeded on the 17th and 5th day, respectively. The possible causes of these changes are discussed.

96—Neuropathological Evaluation of Monkeys Exposed to Body-Alone X-radiation. W. HAYMAKER (NASA, Ames Research Center, Moffett Field, Calif.), D. STURROCK, J. H. KIRK, H. W. CASEY (USAF, School of Aerospace Medicine, Brooks AFB, Tex.), and N. A. CALL (Mercy Institute of Biomedical Research, Denver, Colo.). *Space Life Sciences*, vol. 3, June 1972, p. 210-225. 7 refs.

Investigation of the problem of whether morphological changes occurring in the central nervous system (CNS) following whole-body irradiation are attributable in part to abscopal factors. The 12 monkeys irradiated and the 6 that served as controls were chosen from a pool of 25 young monkeys. Over the postirradiation survival period of 14 days the hematocrit and hemoglobin values varied only slightly from the baseline values and from the values in the 6 control animals. White cell fractions were reduced in quantity but tended to recover relatively soon after irradiation. The design of this experiment was regarded as adequate to allow a conclusion whether pathological changes in the CNS of the irradiated animals differed from or exceeded those observed in the control animals. That such occurred on both counts in 3 of the 12 irradiated animals was evident. It appears that all the lesions must have been abscopally induced.

97—Observations on Microwave Hazards to USAF Personnel. L. T. ODLAND (USAF, Radiological Health Laboratory, Wright-Patterson AFB, Ohio). *Journal of Occupational Medicine*, vol. 14, July 1972, p. 554-547. 17 refs.

Consideration of microwave injury experiences and possible potential hazards of microwave exposures to microwave operators in an attempt to assess the validity of present USAF exposure safety limits. Particular attention is given to the incidence of cataract in members of USAF personnel exposed to microwave radiation. It is pointed out that the present 10 mw/sq cm exposure limit may be subject to a future revision when warranted by new evidence. It is also indicated that the eye is not the most vulnerable organ and that the use of cataract development as a criterion of microwave damage is conditional.

98—Effects of Backscatter of Brief High Intensity Light on Physiological Responses of Instrument-Rated Pilots and Non-Pilots. A. R. ZEINER and G. A. BRECHER (University of Oklahoma, Oklahoma City, Okl.) February 1972. 9 pp. Report No. FAA-AM-72-8.

Thirty-nine human subjects were exposed to repetitive backscatter light stimulation (off a white wall or fog) from a Grimes capacitance discharge airplane anticollision light flashing at 1.27 Hertz. Both tonic (light stimulus absent) and phasic (light stimulus present) stimulus-bound occipital EEG, heart rate, respiration, skin potentials, and eyeblinks were recorded. In the first experiment, response decrement (habituation) to the flashing light occurred only with one out of five response measures (skin potential) over a 40-trial session indicating that the flashing