

Russian and Japanese Aerospace Literature

This issue of *Journal of Propulsion and Power* carries selected abstracts on leading research topics from Russian aerospace literature and from similar Japanese literature. The topic of Jet Flow has been chosen and the abstracts reviewed for pertinency by *Journal of Propulsion and Power* editors.

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Russian Aerospace Literature Jet Flow

A93-51912 Calculation of a plane supersonic jet simulating the exhaust jet of a hypersonic flight vehicle engine (Raschet ploskoj sverkhzvukovoj strui, modeliruyushchej vykhlopnyuyu struyu dvigatelya giperzvukovogo LA). V V SILAEV, *Problems in the aerodynamics of flight vehicles and their components* (A93-51901 22-02). Moscow, Russia, Moskovskij Aviatsonnyj Institut, 1992, pp. 70-75. 5 Refs

The main differential equation of gas dynamics for a plane steady state potential nonviscous flow is solved by the layer-by-layer method of characteristics. The method combines the properties of orthogonal grid methods and those of the traditional version of the method of characteristics. A full system of equations is then derived which includes differential equations of characteristics, compatibility conditions, the Bernoulli equation, and the equation of state. Based on this approach, a program has been developed for calculating plane supersonic jets simulating the exhaust flow of the engines of hypersonic flight vehicles. A calculation example is included.

A93-51772 Development of resonance perturbations in a supersonic jet (Rezonansnoe razvitiye vozmushchenij v sverkhzvukovoj strue). N. A. ZHELTUKHIN and N. M. TEREKHOVA, *PMTF - Prikladnaya Mekhanika i Tekhnicheskaya Fizika* (ISSN 0869- 5032), No. 2, Mar.-Apr. 1993, pp. 82-89. 7 Refs

Dynamics of wave formation in a thermally nonconducting gas outflowing from a circular nozzle is considered using a model of a nonlinear three-wave resonance system with minimum interactions relatively to initial linear processes. The dynamical model is verified taking into account realization conditions for resonance mechanisms in the development of wave processes in flows. Calculation results are applied to three cases: (1) the intensity of a spiral wave is greater than that of an axisymmetric wave, (2) the intensity of an axisymmetric wave is greater than that of a spiral wave, and (3) the intensities of all waves are different.

A93-51759 Acoustic intensity of nonisothermal coaxial jets with an inverted velocity profile (Akusticheskaya moshchnost' neizotermicheskikh soosnykh struj s 'perevernutyj' profilom skorostej). V M. KUZNETSOV, TsAGI, Trudy, No. 2355, 1988, pp. 59-64. 7 Refs

A parametric study is made of the noise of nonisothermal coaxial jets with different initial mean velocity profiles. It is shown that the decrease in acoustic intensity due to the conversion of the initial mean velocity profile is greater for nonisothermal jet than for isothermal jets. The use of the inverted temperature profile makes the acoustic effect due to the inverted mean velocity profile more pronounced.

A93-48040 Nonequilibrium radiation from the CO₂ band (1B₂ - X¹Σ_g⁺) in shock-heated flows. A. V. EREMIN and V. S. ZIBOROV, *Shock Waves* (ISSN 0938-1287), Vol. 3, No. 1, 1993, pp. 11-17. 9 Refs

The processes of population and decay of the optically active state CO₂(1B₂) behind shock waves and in supersonic jets are investigated. It is shown that the vibrational distribution function of the electronically excited state 1B₂ is determined by the full energy of the colliding particles CO and O and, at temperatures above 3000 K, the branch of dissociation with the electronically excited O(1D) atoms is essential.

A93-51822 Effect of the parameters of an external feedback loop on the characteristics of self-oscillations during the impingement of an underexpanded jet on a finite obstacle (Vliyanie parametrov vneshnej tsepi obratnoj svyazi na kharakteristiki avtokolebanij pri natekanii nedorasshirennoj strui na konechnuyu pregradu). S. G. MIRONOV, *PMTF - Prikladnaya Mekhanika i Tekhnicheskaya Fizika* (ISSN 0044- 4626), No. 1, Jan.-Feb. 1993, pp. 94-100. 16 Refs

The effect of the velocity of acoustic waves traveling from the obstacle to the nozzle and their intensity near the nozzle edge on the amplitude-frequency and phase characteristics of self-oscillations generated during the impingement of an underexpanded jet on the end of a finite cylinder is investigated experimentally. The results obtained are analyzed from the standpoint of the two principal mechanisms of sustained self-oscillations in such jet systems: feedback through waves in the shock layer between the obstacle and the central shock wave and feedback through acoustic waves propagating in the ambient medium.

A93-51767 Modification of turbulence models for an axisymmetric jet flow (Modernizatsiya modelej turbulentnosti dlya osesimmetrichnogo strujnogo techeniya). V E. KOZLOV, *PMTF - Prikladnaya Mekhanika i Tekhnicheskaya Fizika* (ISSN 0869- 5032) No. 2, Mar.-Apr. 1993, pp. 43-48. 8 Refs

Modification of 1D and 2D turbulence models based on the Prandtl theory for plane and axisymmetric jet flows is proposed to obtain high-accuracy descriptions of axisymmetric jet mixing. The modification is based on replacing the modulus of a velocity gradient with its effective value. The modified models are verified by applying them to an axisymmetric isobaric flooded jet in an incompressible flow.

A93-50199 Design and investigation of the stand and flying scramjet models - Conceptions and results of experiments. O. N. ROMANKOV and F. I. TAROSTIN, 29th AIAA, SAE, ASME, and ASSEE, Joint Propulsion Conference and Exhibit, Monterey, CA, June 28-30, 1993. 12 pp. 17 Refs. (AIAA Paper 93-2447).

The results of numerical and experimental investigation of fundamental concepts of scramjet models are discussed. It is shown that echeloned pylons and uniformly cascaded injectors can be placed along a combustor section in an efficient fuel feeding scheme for Mach numbers from 4.5 to 14. For $M = 4.5-7$ good results are obtained for thermal choking in the combustor end in a pseudoshock model.

A93-49807 A new class of porous injectors for combustion chambers and gas generators. VLADIMIR G. BAZAROV, 29th AIAA, SAE, ASME, and ASSEE, Joint Propulsion Conference and Exhibit, Monterey, CA, June 28-30, 1993. 7 pp. 5 Refs. (AIAA Paper 93-1955).

Different injectors based on porous permeable materials for atomizing elements developed in Moscow Aviation Institute to improve atomization and mixing of propellants are described. Injectors with wetted porous element blown through by gas, porous wetted element with one or several through channels for a liquid stream, and porous swirl injectors are considered. It is concluded that these injectors make it possible to obtain extremely fine dispersity of droplets in aerosol or bubbles in emulsions and improve the efficiency of a gas flow for liquid atomization.

A93-50198 Experimental studies of aerodynamic performances of hypersonic scramjet in impulse hot-shot tunnel. V. I. ZVEGINSEV, 29th AIAA, SAE, ASME, and ASEE, Joint Propulsion Conference and Exhibit, Monterey, CA, June 28-30, 1993. 6 pp. 3 Refs. (AIAA Paper 93-2446)

Based on the investigations performed at the Institute of Theoretical and Applied Mechanics, Siberian Division of the Russian Academy of Sciences, Novosibirsk, in the 70's a new scheme of scramjet was worked out which involved a convergent inlet, a combustion chamber of compact cross section, and a divergent conical nozzle. Tests of the model of a hypersonic vehicle having a hydrogen-operated engine of the mentioned scheme were carried out in the hot-shot tunnel at $M = 7.9$ and enabled to find total aerodynamic performances within a wide range of fuel injection rate. We obtained an excessive thrust of power plant and demonstrated the model motion against free stream under the effect of the thrust. This paper presents estimates of the summands of the total aerodynamic force and the value of combustion efficiency.

A93-47507 Numerical investigation of the mixing of an underexpanded gas jet with a supersonic cross-stream (Chislennoe issledovanie smesheniya nedorasshirennoy gazovoy strui so sverkhzvukovym snosyashchim potokom). S. I. BARANOVSKIY, I. V. KONVALOV, T. F. SAVINA, and A. G. TIKHONOV, *Turbulent flow problems* (A93-47505 19-34). Moscow, Tsentral'nyy Institut Aviatsionnogo Motorostroeniya, 1991, pp. 27-36. 9 Refs.

A method for the calculation of the interaction and mixing of a nonisobaric circular gas jet with a supersonic cross-stream is proposed. The calculation covers the parameters of the whole flow field, including the region of turbulent mixing of the jet with the supersonic cross-stream. Calculation results are compared with experimental data, showing that the proposed method satisfactorily describes the characteristics of the flow field.

A93-47505 Turbulent flow problems Problemy turbulentnykh techeniy. S. YU. KRASHENINNIKOV, Moscow, Tsentral'nyy Institut Aviatsionnogo Motorostroeniya (TsIAM, Trudy, No. 1287), 1991, 267 pp. (For individual items see A93-47506 to A93-47522).

Complex jet flows, turbulent combustion, two-phase turbulent flows, and transition to turbulence in a boundary layer are the topics discussed. Particular attention is given to the computation of the effect of turbulent transfer and secondary flows on the structure of 3D jets, laser diagnostics of a turbulent velocity field in jets with combustion, the effect of turbulence of the mixing of a gas and a collection of particles, and the effect of low-frequency velocity variations of the outer flow on the flow in a 2D laminar boundary layer on a plate.

A93-39237 Classification of modes of the electrostatic dispersion of fluids (O klassifikatsii rezhimov elektrostatsicheskogo dispergirovaniya zhidkosti). S. O. SHIRIAEVA, A. I. GRIGOR'EV, and L. S. PODVAL'NYI, *Pis'ma v Zhurnal Tekhnicheskoy Fiziki* (ISSN 0320-0116), Vol. 19, No. 4, Feb. 26, 1993, pp. 36-41. 16 Refs.

Characteristic times describing the electrodispersion of fluids are examined. Diagrams illustrating successive changes of the electrodispersion modes of low-viscosity and viscous fluids are presented. In the case of low-viscosity fluids, the order is as follows: dripping mode, jet-dripping mode, spindle mode, microdripping mode, and cone-short jet mode. In the case of viscous fluids, the order is dripping mode-long neck, intermittent cone-jet mode, and cone-long jet mode.

A93-39126 Problems in physical gas dynamics (Problemy fizicheskoi gazovoi dinamiki). V. IA. NEILAND, V. M. KUZNETSOV, and T. S. SHADRINA, Moscow, Izdatel'skii Otdel TsAGI (TsAGI, Trudy, No. 2424), 1990, 338 pp. (For individual items see A93-39127 to A93-39152)

The papers contained in this volume are concerned with fundamental and applied research in the field of physical gas dynamics. A series of papers are presented which deal with the study of polyatomic gases and gas mixtures using asymptotic methods based on the kinetic theory of gases. Particular attention is given to studies of nonequilibrium flows of gases and low-temperature plasma using analytical methods and methods of computational physics, including studies of the structure of polyphase flows and gas flows with condensation. Consideration is also given to the aerophysical experiment, including papers on heterogeneous recombination in materials with varying catalytic properties, electron temperature diagnostics in strong shock waves, and characteristics of flow in gasdynamic shock tubes.

A93-57088 Influence of propellant injector dynamic characteristics on combustion stability and efficiency. V. G. BAZAROV, 43rd IAF, International Astronautical Congress, Washington, Aug. 28-Sept. 5, 1992. 5 pp. 7 Refs. (IAF Paper 92-0645).

A survey of test results comprising dynamic characteristics of propellant injectors and the influence of unsteady propellant injector operation in high-energy release combustion chambers on combustion efficiency and stability is presented. It is determined that the response of the operating process in combustion chambers to the variation of propellant injector amplitude and phase characteristics, may serve as a diagnostic factor of instability mechanism. It is demonstrated that both self-sustained or induced unsteady injector operation leads to sufficient changes in the atomizing and mixing process and can provide a more uniform combustible mixture as well as elongation of the combustion zone.

A93-43018 Visual study of the interaction of a round liquid jet with transverse flow (Vizual'noe issledovanie vzaimodeystviya krugloj strui zhidkosti i snosyashchego potoka). A. S. GUZEEV, V. A. TYUSHKEVICH, and I. S. KHRISTICH, *Sibirskiy Fiziko-Tekhnicheskij Zhurnal* (ISSN 0869-1339), No. 1, Jan.-Feb. 1993, pp. 142-146. 6 Refs.

Results of visualization studies of the interaction between a round liquid jet and transverse flow, conducted in a vertical hydrodynamic tunnel, are reported. The discussion covers (1) the evolution of a round jet injected into the transverse flow from a plane surface normal to the flow and (2) a round jet injected normal to the surface of an ellipsoid model with an aspect ratio of 1.3. Sample photographs of interaction patterns are presented.

A93-35339 Calculation of the irregular interaction of shock waves (K raschetu nereguliarnogo vzaimodeystviya udarnykh voln). I. S. BELOTSEKOVETS and V. I. TIMOSHENKO, *PMTF - Prikladnaya Mekhanika i Tekhnicheskaya Fizika* (ISSN 0044-4626), No. 6, Nov.-Dec. 1992, pp. 9-14. 9 Refs.

The problem of the irregular Mach interaction (reflection) of shock waves is investigated analytically. By using a formulation proposed in an earlier study (Belotserkovets and Timoshenko, 1984), the Mach interaction of shock waves is calculated with allowance for gas viscosity. The analysis employs a simplified Prandtl formula for turbulent viscosity, with a proportionality factor of 0.03. The results are presented in graphic form.

A93-27658 Effect of combustion on the interaction of an underexpanded wall hydrogen jet with supersonic flow in a plane duct (Vliyanie goreniya na vzaimodeystvie pristennoi nedorasshirennoy strui vodoroda so sverkhzvukovym potokom v ploskom kanale). O. M. KOLESNIKOV, *Fizika Goreniya i Vzryva* (ISSN 0430-6228), Vol. 28, No. 6, Nov.-Dec. 1992, pp. 11-17. 8 Refs.

Results of analytical studies of the combustion of an underexpanded wall hydrogen jet, injected into high-temperature supersonic flow along the wall of a plane duct, are reported. Parabolized Navier-Stokes equations are solved by a marching algorithm using global iterations in terms of pressure. Particular attention is given to the effect of combustion on the interaction of the turbulent wall jet with the generated compression shocks. It is shown that combustion leads to a significant increase in the inhomogeneity of the static pressure field, formation of subsonic waves within the supersonic flow, and, in some cases, to the separation in the region of interaction between the strongest compression shock and the boundary layer.

A93-27631 Structure of a boundary layer with ethanol injection and combustion (Struktura pogranichnogo sloia so vduvom i goreniem etanola). B. F. BOIARSHINOV, E. P. VOLCHKOV, and V. I. TEREKHOV, *Fizika Goreniya i Vzryva* (ISSN 0430-6228), Vol. 28, No. 3, May-June 1992, pp. 29-36. 20 Refs.

The structure of a boundary layer with ethanol injection and combustion is investigated experimentally in order to test the validity of assumptions used in computational models. Data on the velocity fields, chemical compound concentrations, and temperature distributions are obtained for flow velocities up to 70 m/s. It is shown that the chemical reaction process remains multistage over the entire range of combustion regimes. The main conditions of the flame front model are satisfied in a laminar boundary layer in the presence of a thin stationary luminescent surface. With the increasing flow rate, the mean temperatures and concentrations of the combustion products significantly decrease, but the similarity of dimensionless parameter fields are retained.

A93-12838 Calculation of momentum and heat transfer in turbulent jet flows of a gas with dispersed particles (Raschet perenosa impul'sa i tepla v turbulentnykh gazodispersnykh struiynykh techeniyakh). A. A. VINBERG, L. I. ZAICHIK, and V. A. PERSHUKOV, *Rossiyskaya Akademiya Nauk, Izvestiya, Mekhanika Zhidkosti i Gaza* (ISSN 0568-5281), No. 3, May-June 1992, pp. 69-80. 23 Refs.

Jet flows of a gas with dispersed particles are investigated within the framework of the Eulerian approach using equations for the second moments of velocity fluctuations and disperse phase temperature. The volume fraction of the solid particles is assumed to be small, so that collision between solid particles can be neglected. In addition to equations of turbulent gas energy and its dissipation, the computational scheme also contains equations of the turbulent energy and turbulent thermal flow of the solid phase. The model, however, does not include any empirical constants related to the presence of solid particles.

A93-10176 Turbulent jet flows with condensation and electrophysical effects (Russian book) (Turbulentnye struiyny techeniya s kondensatsionnymi i elektrofizicheskimi efektami). A. B. VATAZHIN, Moscow, Tsentral'nyy Institut Aviatsionnogo Motorostroeniya (TsIAM, Trudy, No. 1288 (1)), 1991, 176 pp.

The papers presented in this volume provide an overview of experimental, theoretical, and numerical research concerned with turbulent jet flows in the presence of condensation and electrophysical effects. In particular, attention is given to the frequency and volt-ampere characteristics of a corona discharge in gas flow, an electrostatic probe for determining particle characteristics in disperse flow, and an experimental study of the condensation of vapor-air jets. Papers are also presented on the numerical modeling of two-phase isobaric jets with homogeneous and heterogeneous condensation, effect of surfactants on condensation in vapor-air jets, and a study of the pulsed electrical field near the jet of a turbojet engine. (For individual items see A93-10177 to A93-10184)

A93-19206 Experimental investigations and efficiency prediction of jet noise reduction techniques. VLADIMIR M. KUZNETSOV, *Proceedings of the 14th DGLR/AIAA Aeroacoustics Conference, Vol. 2*, Aachen, Germany, May 11-14, 1992, (A93-19126 05-71), Bonn, Deutsche Gesellschaft fuer Luft- und Raumfahrt, 1992, pp. 761-766, 15 Refs

The study presents prediction evaluation results and compares them with an experimental investigation of the efficiency of a number of jet noise reduction techniques. The space noise distribution of turbulent jet parts of different lengths is predicted. The sound field evaluation is based on an analysis of convective wave equation solutions and on the application of experimental data on turbulence characteristics in the mixing region. The sound field prediction results for turbulent jet parts are used to evaluate jet flow noise by dividing the mixing regions into separate parts and by estimating the acoustic radiation intensity of those parts. The jet noise reduction efficiency is evaluated by by-pass nozzles due to the 'inverted' velocity profile application as well as the efficiency of multijet devices used at the nozzle exit plane.

A93-19196 Control of coherent structures and aero-acoustic characteristics of subsonic and supersonic turbulent jets. E. V. VLASOV, A. S. GINEVSKII and V. G. PIMSHEIN, *Proceedings of the 14th DGLR/AIAA Aeroacoustics Conference, Vol. 2*, Aachen, Germany, May 11-14, 1992, (A93-19126 05-71), Bonn, Deutsche Gesellschaft fuer Luft- und Raumfahrt, 1992, pp. 672-678, 12 Refs

Three important problems associated with the role of large-scale coherent structures of jet flows in turbulent mixing processes and in aerodynamic noise generation are investigated in the present work. Firstly, new data illustrating the relation between coherent subsonic jet structures and their sensitivity to the periodic excitation and the jet noise in its far and near field are received. Secondly, from visual investigations of subsonic turbulent jets under high-intensity sound wave excitation there was investigated the interaction of sound waves and large-scale vortex structures generated by them. Thirdly, noise reduction methods for subsonic and supersonic non-isobaric turbulent jets are studied. Those methods are based on the aeroacoustic interaction effect.

A93-14247 Experimental investigation of hydrogen burning and heat transfer in annular duct at supersonic velocity. V. A. VINOGRADOV, R. V. ALBEGOV, and M. D. PETROV, *Proceedings of the 18th ICAS, Congress, Vol. 1*, Beijing, China, Sept. 20-25, 1992, (A93-14151 03-01), Washington, American Institute of Aeronautics and Astronautics, Inc., 1992, pp. 737-743, 6 Refs

An experimental study of a model axisymmetric scramjet with an annular chamber is reported. Conditions of engine operation organization with supersonic velocity in the chamber are analyzed. When H₂ is injected both through I and II and I and V rows of injectors the combustion efficiency varies from 0.7 at beta sub Sigma = 1 to 0.95-1 at beta sub Sigma of not greater than 0.5. When H₂ is injected only through row V over the whole range of beta sub v = 0.33-0.9, there is no ignition of the fuel, as the dimensions of the flameholders are not sufficient for self-ignition under the conditions studied. The relative heat flux ratio into the walls at beta sub Sigma = 1 is 20-25 percent from the heat emitted as a result of combustion.

A93-12810 An experimental study of a method for reducing the jet noise of bypass engines using mechanical flow mixers (Eksperimental'noe issledovanie metoda snizheniia shuma strui TRDD s pomoshch'iu mekhanicheskikh smesitelei: potokov). I. S. ZAGUZOV and K. V. KAKHOVSKII, *Aviatsionnaia Tekhnika* (ISSN 0579-2975), No. 1, 1992, pp. 46-49, 2 Refs

Results of an experimental study of the effect of lobe mixers on the noise level of bypass turbofan engines are examined. It is shown that the principal parameter responsible for the effective reduction of the jet noise is the radial clearance between the mixer lobes and the discharge nozzle. A diagram of an experimental 18-lobe mixer is presented.

N92-31530 YLIFE-2 inertial fusion energy power plant design. R. W. MOIR, Lawrence Livermore National Lab., CA, 12 pp. Presented at the 10th Topical Meeting on Technology of Fusion Energy, Boston, MA, 7-12 Jun. 1992 (DE92-011965, UCRL-JC-109522, CONF-920607-10)

The YLIFE-2 inertial fusion power plant design study uses a liquid fall in the form of jets, to protect the first structural wall from neutron damage, x rays, and blast to provide a 30-y lifetime. YLIFE-1 used liquid lithium. YLIFE-2 avoids the fire hazard of lithium by using a molten salt composed of fluorine, lithium, and beryllium (LiBeF₄) called Flibe. Access for heavy-ion beams is provided. Calculations for assumed heavy-ion beam performance show a nominal gain of 70 at 5 MJ producing 350 MJ, about 5.2 times less yield than the 1.8 GJ from a driver energy of 4.5 MJ with gain of 400 for YLIFE-1. The nominal 1 GWe of power can be maintained by increasing the repetition rate by a factor of about 5.2 from 1.5 to 8 Hz. A higher repetition rate requires faster re-establishment of the jets after a shot which can be accomplished in part by decreasing the jet fall height and increasing the jet flow velocity. In addition, although not adequately considered for YLIFE-1, there is liquid splash that must be forcibly cleared because gravity is too slow, at higher repetition rates than 1 Hz. Splash removal is accomplished in the central region by oscillating jet flows. The cost of electricity is estimated to be 0.09 \$/kWh in constant 1988 dollars, about twice that of future coal and light water reactor nuclear power. The driver beam cost is about one-half the total cost, that is, a zero cost driver would give a calculated cost of electricity of 0.045 \$/kWh.

A93-15190 Numerical modeling of pulsed jets of a viscous heat-conducting gas (Chislennoe modelirovanie impul'snykh strui viazkogo teploprovodnogo gaza). N. M. BULGAKOVA, *PMTF - Prikladnaia Mekhanika i Tekhnicheskaya Fizika* (ISSN 0044-4626), No. 4, July-Aug. 1992, pp. 93-99, 14 Refs

The problem of a pulsed gas jet issuing into a submerged space is solved analytically using the method proposed by Berezhin et al. (1972, 1976). The results can be applied to the description of the start-up of jets and quasi-stationary erosion flames. The transition to a steady-state regime corresponds to the solution of the steady-state problem.

A93-12820 Effect of the powerplant configuration on the air flow rate of the jet shield (Vliianie konfiguratsii silovoi ustanovki na rashkod vozdukh strui noi zashchity). M. M. VYSOKOGORETS and M. G. KHABIBULLIN, *Aviatsionnaia Tekhnika* (ISSN 0579-2975), No. 1, 1992, pp. 87, 88, 4 Refs.

The use of a jet screen is examined as a promising method of preventing the entry of the high-temperature gases of the reverse jet into the air intake during the landing run. A generalized relation is obtained which makes it possible to determine the required air flow rate of the jet shield for the known powerplant configuration and speed of the landing run.

A93-10402 Self-excited oscillations at supersonic off-design jet outflow. V. N. GLAZNEV, *Russian Journal of Theoretical and Applied Mechanics* (ISSN 1051-8045), Vol. 2, No. 1, March 1992, pp. 29-40, 4 Refs.

We consider self-excited oscillations during underexpanded jet outflow to a resting medium and its flow to a plane obstacle. Experimental results concerned with the detailed investigations of spatial-temporal oscillation field structure in both jets and their external acoustic fields are presented. We demonstrate that self-excited oscillations are implemented via a 'chain' of acoustic vortex interactions.

A93-10180 Experimental study of condensation vapor-air jets (Eksperimental'nye issledovaniia kondensatsionnykh parovozdushnykh strui). A. B. VATAZHIN, V. A. LIKHTEI, and V. I. SHUL'GIN, *Turbulent jet flows with condensation and electrophysical effects* (A93-10176 01-34), Moscow, Tsentral'nyi Institut Aviatsionnogo Motorostroeniia, 1991, pp. 63-82, 51 Refs

The characteristics of vapor condensation in jet flows are examined. An experimental setup for studying vapor jets and methods for measuring their disperse characteristics is described. Experimental results are presented concerning the position of the condensation region within a vapor jet as well as changes of the jet temperature and Sauter mean diameter along its axis.

A93-10136 Using Langevin equations for calculating turbulent transfer coefficients (Primenenie uravnenii (Lanzhevena k raschetu koefitsientov turbulentnogo perenosu). A. G. GUMILEVSKII, *Rossiiskaya Akademiia Nauk, Izvestia, Mekhanika Zhidkosti i Gaza* (ISSN 0568-5281), No. 2, Mar.-Apr. 1992, pp. 47-54, 15 Refs

The use of Langevin equations for obtaining expressions relating turbulent transfer coefficients to the principal flow parameters is briefly reviewed. Here, a kinetic equation of the Fokker-Planck type is obtained which describes the evolution of the probability density of moles in arbitrary coordinates. The kinetic equation is then used to determine turbulent transfer coefficients in plane stratified flows and swirling axisymmetric jets.

N92-31990 An examination of the feasibility of a nuclear-pumped laser-driven inertial confinement fusion reactor with magnetically protected walls M.S. Thesis. JOHN M. JACOBSON, Air Force Inst. of Tech., Wright-Patterson AFB, OH, 62 pp. (AD-A248163, AFIT/GNE/ENP/92M-4)

A preliminary design study of a nuclear-pumped laser-driven inertial confinement fusion reactor with a magnetically protected first wall using an advanced DT-ignited, DD-fueled pellet demonstrated the feasibility of such a concept. This paper presents a parametric study of the required energy multiplication in the blanket, the pellet injection rate, and the net efficiency of this in the conceptual reactor for advanced pellet yields. A model of the reactor energy balance yields a required energy multiplication of 2.4. A cylindrical design for a helium-cooled blanket demonstrates that natural uranium micropellets in a laser pump region provide a multiplication of 2.9 with a subcritical neutron multiplication factor of 0.14. A lithium-oxide layer outside of the laser pump region provides a tritium breeding ratio of up to 0.4, which is more than sufficient to produce enough tritium for advanced DD-fueled, DT-ignited pellets to fuel the reactor. This paper presents the analysis behind these conclusions and presents avenues for further research on this concept.

A92-22918 Superconducting electron focusing and guiding based on the Andreev reflection mechanism. GANG XIAO and DENG-PING XUE, *Applied Physics Letters* (ISSN 0003-6951), Vol. 60, Jan. 27, 1992, pp. 504-506, 8 Refs. (NSF DMR-90-24402).

A normal-metal-superconductor (NMS) composite structure for electron focusing and guiding based on the Andreev reflection (AR) principle is proposed. The thin-film-based structure with an NMS edge interface consists of an injector and a periodic array of detectors, which are integral parts of the normal-metal film and can be patterned with electron lithographic techniques. The model system performance has been evaluated numerically.