

IMuST INSTITUTE OF MULTIFLUID SCIENCE AND TECHNOLOGY

Correspondence on Action Items from the First Annual Meeting to Membership from T.G. Theofanous

- Action 1:** To aggressively pursue "Education" in Multiphase Flow.
- Action 2:** To pursue the work on dispersed flows presented in our last meeting to conclusions.
- Action 3:** To focus our next meeting on Flow Regimes.
- Action 4:** To pursue cooperative efforts toward identifying and settling key Flow Regime issues.
- Action 5:** To pursue cooperative efforts towards the understanding and development of design tools, for multiphase stirred vessels (including sparged, slurry liquids).
- Action 6:** To continue to refine the TAC efforts towards useful conclusions.

PS. Much of our activities will be built around the IMuST web site. Please visit regularly <http://www.chemengr.ucsb.edu/imust>.

ACTION 1: TO AGGRESSIVELY PURSUE "EDUCATION" IN MULTIPHASE FLOW

The survey conducted by the Education TAC of IMuST indicated quite clearly that the whole enterprise of formal teaching of Multiphase Flow in colleges and universities is in disarray. At the meeting Mark McCready presented initial plans for a new textbook. Bucky Kashiwa suggested the development of a multilevel course (including possibly mechanics for certification) on the web, and in general everybody was strongly in favor of taking concerted, cooperative action. The incentives in this area are right for everybody to contribute, as we all have something to learn too, especially on how best to systematize and pass on the knowledge.

During this year we will compile on the web, under IMuST Education, the following materials:

- A. Course Content.**
Major headlines. Please indicate respective number of lectures, if possible. Please indicate undergraduate or graduate.
- B. Homework Problems.**
Statements sufficient, solutions desirable. Here is the place for us to put our favorite problems. Any number acceptable, no complete set required. Any number of submissions acceptable.
- C. Demonstration, Experiments and Movies.**
Brief descriptions of easy to do experiments. Movies from experiments and/or CFD simulations. Brief description of key points to be made.
- D. Teaching Modules.**
Complete write-ups on specific topics. Brief description of prerequisites. Ideally, written for self-study by students, but acceptable also if aimed for the instructor.

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, make any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

PROCEDURE

1. Submit materials by e-mail or hard copy to all members of the Executive Committee, at any time.
2. Review and response within one month.
3. Accepted material will be put on the web. IMuST members agree to acknowledge the authors in the use of these materials. The materials under B and C above will be categorized according to a standardized plan developed from the contents under A.
4. Different approaches to the same topic are welcome, i.e. a topic is not preempted by the first submittal on it.
5. It may be premature to think now about author's rewards for their efforts, but several things come to mind.
 - a. Satisfaction to have contributed to a common goal, and fun working with colleagues in such an interesting project.
 - b. Acknowledgement, through IMuST, by the frequency of use, and written comments.
 - c. "Ownership" in the final course that might emerge from such an effort.

ACTION 2: TO PURSUE THE WORK ON DISPERSED FLOWS PRESENTED IN OUR LAST MEETING TO CONCLUSIONS.

In our last meeting several papers were presented on the Field Equation, their numerical solutions (CFD), and on comparison of such solutions with experiments or exact results. (Please refer to papers by Kashiwa, Sangani, Prosperetti, Ishii, Wallis, Theofanous, Dudukovic, and Podowski, <http://www.chemengr.ucsb.edu/imust>).

We would like to add to this material in a way that clarifies any issues, thus allowing conclusions to be drawn to the highest degree of definiteness and generality, as possible.

This effort is structured so that it allows an open discussion on the internet, aiming for conclusion at or prior to our next meeting.

A. Field Equations for Dispersed Systems.

Which terms are in questions? What are the options? What is the significance?

B. Computer Codes.

B.1 Field Equations.

B.2 Constitutive Laws.

B.3 Verification/Validation Basis.

B.4 Intended purpose(s).

C. Test Problem Challenges

C.1 Definition of Selected Test Problems.

C.2 Code Results.

IMuST members are invited to submit contributions to any of the above. It is expected that these will be self-contained, with any references made only for details, or more of similar results.

PROCEDURE

1. It is expected that results presented in the papers noted above can be revisited with other formulations and/or other codes, in a successively refocusing process, expanding to other problems as well.
2. To contribute under C, a new problem/challenge you do not have to have made contributions under A or B. However, to contribute to a solution under C, you should have the code used be fully characterized under B.
3. Submit contributions by e-mail or hard copy to all members of the Executive Committee.
4. Review and respond within 1 month.
5. Accepted materials will be put on the IMuST web site.
6. Use of such materials for reference purposes should site the IMuST web site and should acknowledge the authors. There is no intent here to turn this into an archival process, but only to allow maximum interactions and acknowledgement of efforts of those that contribute. Periodic archiving in review-type papers will be undertaken as the content of the compiled material justifies.

ACTION 3: TO FOCUS OUR NEXT MEETING ON FLOW REGIMES

As discussed at the workshop, we are to address "flow regimes" in their most general context; that is, distinctive spatial phase distributions, and their evolution with time (in non-steady flows). Some of the needed systematics needed for structuring the program will derive from work under Action 4. Under the present action we shall carry out complementary work in identifying individuals currently active, and others with previous experience in this area.

All IMuST members are invited to help us identify such individuals. Please send name(s) (including your own if applicable) and a few words of explanation. Also, we welcome your comments and suggestions.

ACTION 4: TO PURSUE COOPERATIVE EFFORTS TOWARDS IDENTIFYING AND SELECTING FLOW REGIME ISSUES.

This action has to evolve, iteratively, between collecting information, and evaluating it to determine the next step. As a first step, I propose that each TAC is asked to prepare a statement that addresses the following questions relative to the respective area of application.

- A. What flow regimes and transitions are of the main interest? Why?
- B. What are key issues relative to design and/or prediction, and what would be the expected payoff if resolved?
- C. What is the range of conditions in practice? How do these relate to the data base?
- D. Are there any data banks available for general (open) use? Are there any data banks available for limited use (under special arrangements)?

ACTION 5: TO PURSUE COOPERATIVE EFFORTS TOWARDS THE UNDERSTANDING AND DEVELOPMENT OF DESIGN TOOLS, FOR MULTIPHASE STIRRED VESSELS (INCLUDING SPURGED SLURRY LIQUIDS).

Kostas Kontomaris was appointed to spearhead this effort. He will assemble a Steering Committee to carry on the development of an approach. Key aspects of this work will be posted, as become available, on the IMuST web page under "Stirred Vessels."

Kostas and his committee will communicate directly with the IMuST membership. Please send him your suggestions (kontomk@esvax.dnet.dupont.com).

ACTION 6: TO CONTINUE TO REFINES THE TAC EFFORTS TOWARDS USEFUL CONCLUSIONS.

The TAC reports during our First Annual Meeting are available at the IMuST web page, and they appear also in the Proceedings.

We request that IMuST members provide their critique of any number of these reports that they feel knowledgeable and interested about. Please send these to TAC chairs, listed below, and copy the Executive Committee members.

Based on these comments the TACs, under the direction of respective chairs, will revise the preliminary reports and will take action items to complete in time for one more iteration with the membership prior to our 2nd Annual Meeting (mid-March of 1999).

TAC	CHAIRS	E-MAIL
Analytical Solutions TAC	A. Prosperetti	prosper@titan.me.jhu.edu
Education TAC	G.B. Wallis	graham.b.wallis@dartmouth.edu
CFD TAC	B. Kashiwa	bak@lanl.gov
Oil/Gas TAC	J.D. Hudson	jdhudson@shellus.com
Chemical/Petrochem TAC	J. Tilton	james.n.tilton@usa.dupont.com
Regrigeration TAC	T. Newell	t-newell@uiuc.edu
Microelectronics TAC	R. Chu	rcchu@vnet.ibm.com
Nuclear TAC	M. Ishii	ishii@ecn.purdue.edu

Executive Committee:

T. Hanratty	hanratty@aries.scs.uiuc.edu	Vice President
J.D. Hudson	jdhudson@shellus.com	(ex officio), Treasurer
A. Prosperetti	prosper@titan.me.jhu.edu	member
M. Roco	mroco@nsf.gov	member
T. G. Theofanous	theo@theo.ucsb.edu	President
J. Tilton	james.n.tilton@usa.dupont.com	(ex officio)
G. Wallis	graham.b.wallis@dartmouth.edu	member