## Proceedings of ASME Turbo Expo 2022: Turbomachinery Technical Conference and Exposition

(GT2022)

Volume 3A

June 13-17, 2022 Rotterdam, The Netherlands

> Conference Sponsor International Gas Turbine Institute

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

Two Park Avenue \* New York, N.Y. 10016

© 2022, The American Society of Mechanical Engineers, 2 Park Avenue, New York, NY 10016, USA (www.asme.org)

All rights reserved. Printed in the United States of America. Except as permitted under the United States Copyright Act of 1976, no part of this publication may be reproduced or distributed in any form or by any means, or stored in a database or retrieval system, without the prior written permission of the publisher.

INFORMATION CONTAINED IN THIS WORK HAS BEEN OBTAINED BY THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS FROM SOURCES BELIEVED TO BE RELIABLE. HOWEVER, NEITHER ASME NOR ITS AUTHORS OR EDITORS GUARANTEE THE ACCURACY OR COMPLETENESS OF ANY INFORMATION PUBLISHED IN THIS WORK. NEITHER ASME NOR ITS AUTHORS AND EDITORS SHALL BE RESPONSIBLE FOR ANY ERRORS, OMISSIONS, OR DAMAGES ARISING OUT OF THE USE OF THIS INFORMATION. THE WORK IS PUBLISHED WITH THE UNDERSTANDING THAT ASME AND ITS AUTHORS AND EDITORS ARE SUPPLYING INFORMATION BUT ARE NOT ATTEMPTING TO RENDER ENGINEERING OR OTHER PROFESSIONAL SERVICES. IF SUCH ENGINEERING OR PROFESSIONAL SERVICES ARE REQUIRED, THE ASSISTANCE OF AN APPROPRIATE PROFESSIONAL SHOULD BE SOUGHT.

ASME shall not be responsible for statements or opinions advanced in papers or . . . printed in its publications (B7.1.3). Statement from the Bylaws.

For authorization to photocopy material for internal or personal use under those circumstances not falling within the fair use provisions of the Copyright Act, contact the Copyright Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923, tel: 978-750-8400, www.copyright.com.

Requests for special permission or bulk reproduction should be addressed to the ASME Publishing Department, or submitted online at: https://www.asme.org/publications-submissions/journals/information-for-authors/journalguidelines/rights-and-permissions

ISBN: 978-0-7918-8599-4

## **CONTENTS**

## Proceedings of ASME Turbo Expo 2022: Turbomachinery Technical Conference and Exposition Volume 3A

Combustion, Fuels, and Emissions	
GT2022-77959	. V03AT04A001
GT2022-77975	. V03AT04A002
GT2022-78296  Prediction of Thermoacoustic Instability and Fluid-Structure Interactions for Gas Turbine Combustor Yu Xia, Patrick Sharkey, Ishan Verma, Alok Khaware, and Davor Cokljat	. V03AT04A003
GT2022-78304	. V03AT04A004
GT2022-78404	. V03AT04A005
GT2022-78466	. V03AT04A006
GT2022-78581  Development of an Open-Source Autonomous CFD Meta-Modeling Environment for Small-Scale Combustor Optimization – Part I Alejandro M. Briones and Brent A. Rankin	. V03AT04A007
GT2022-78586	. V03AT04A008
GT2022-79181	. V03AT04A009
GT2022-79347  Computational Fluid Dynamics Modeling of Fuel Properties Impact on Lean Blowout in the ARC-M1 Combustor  Debolina Dasgupta, Sibendu Som, Eric Wood, Tonghun Lee, Eric Mayhew, Jacob Temme, and Chol-Bum Kweon	. V03AT04A010

GT2022-79653	\T04A011
GT2022-79706  Effect of Counter- and Co-Swirl on Low-Frequency Combustion Instabilities of Jet A-1  Spray Flames  Byeonguk Ahn and Kyu Tae Kim	AT04A012
GT2022-79816	AT04A013
GT2022-79904	\T04A014
GT2022-80187	AT04A015
GT2022-80226 Impact of Central Piloting on the Static and Dynamic Stability of Swirl-Stabilized Flames Daniel Doleiden, Ashwini Karmarkar, Jacqueline O'Connor, and James Blust	\T04A016
GT2022-80350	\T04A017
GT2022-80431	\T04A018
GT2022-80577	\T04A019
GT2022-80619	AT04A020
GT2022-80651	\T04A021
GT2022-80673	\T04A022
GT2022-80725  Experimental Investigation of Interactions Between Two Closely Spaced Azimuthal  Modes in a Multi-Nozzle Can Combustor  Jeong-Won Kim, Tony John, Subodh Adhikari, David Wu, Benjamin Emerson,  Vishal Acharya, Timothy Lieuwen, Mitsunori Isono, and Toshihiko Saito	\T04A023

GT2022-80762	)24
GT2022-80771	)25
GT2022-80785	)26
GT2022-80872	)27
GT2022-80895	)28
GT2022-80971	)29
GT2022-80993	)30
GT2022-81127	)31
GT2022-81134	)32
GT2022-81152	)33
GT2022-81188	)34
GT2022-81277	)35
Numerical Prediction of a Lean Blow-Out Event of a Lab-Scale, Swirl-Stabilized Spray Flame Stephan Ruoff, Georg Eckel, Patrick Le Clercq, and Manfred Aigner	)36

GT2022-81366	/03AT04A037
GT2022-81552	/03AT04A038
GT2022-81590	/03AT04A039
GT2022-81619	/03AT04A040
GT2022-81620  Combined Heat and Power Supply Demonstration of Micro-Mix Hydrogen  Combustion Applied to M1A-17 Gas Turbine  Atsushi Horikawa, Mitsugu Ashikaga, Masato Yamaguchi, Tomoyuki Ogino,  Shigeki Aoki, Manfred Wirsum, Harald HW. Funke, and Karsten Kusterer	/03AT04A041
GT2022-81643	/03AT04A042
GT2022-81654	/03AT04A043
GT2022-81682	/03AT04A044
GT2022-81692	/03AT04A045
GT2022-81729	/03AT04A046
GT2022-81745	/03AT04A047
GT2022-81756  Automatized Experimental Combustor Development Using Adaptive Surrogate  Model-Based Optimization  Johann Moritz Reumschüssel, Philipp Maximilian zur Nedden, Jakob G. R. von  Saldern, Thoralf G. Reichel, Bernhard Ćosić, and Christian Oliver Paschereit	/03AT04A048

GT2022-81769	03AT04A049
GT2022-81792  Flametube Evaluation of a Lean-Lean Combustor Concept Developed for Supersonic  Cruise Aircraft  Kathleen M. Tacina, Derek P. Podboy, and Francisco Guzman	03AT04A050
GT2022-81808	03AT04A051
GT2022-81895	03AT04A052
GT2022-81919	03AT04A053
GT2022-82001	03AT04A054
GT2022-82020 Simultaneous Ultra-Small-Angle X-Ray Scattering and X-Ray Transmission Measurements of a Liquid Jet in Crossflow With Film Atomization Brandon A. Sforzo, Jan Ilavsky, and Christopher F. Powell	03AT04A055