

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GENERAL ELECTRIC COMPANY, Petitioner,

v.

UNITED TECHNOLOGIES CORPORATION, Patent Owner

Case IPR2016-00962
Patent No. 9,121,412

DECLARATION OF DR. K. MATHIOUDAKIS

I, Dr. K. Mathioudakis, declare as follows:

I. INTRODUCTION

1. I have been retained by Patent Owner, United Technologies Corporation, as an independent expert and technical consultant in this proceeding before the United States Patent and Trademark Office. Although I am being compensated at a rate of €80 per hour for the time I spend on this matter, no part of my compensation depends on the outcome of this proceeding. I have no other interest in this proceeding.

II. QUALIFICATIONS

2. I have been a Professor in the Department of Mechanical Engineering for the past ten years, and the Director of the Laboratory of Thermal Turbomachines at the National Technical University of Athens (NTUA), Greece. My research interests include investigations into the areas of turbomachinery performance and modelling, as well as energy conversion through thermal machines. I have taught courses that cover, among other things, gas and steam turbine operation, jet engines and their performance, and gas turbine diagnostics.

3. I have conducted research on aircraft engine performance modelling, engine condition monitoring, component fault diagnosis, aircraft engine emissions,

aircraft mission analysis, and flow in the turbomachinery components of aircraft engines.

4. I received an undergraduate degree in Mechanical Engineering in 1980 from NTUA and a post-graduate degree in Fluid Dynamics from the Von Karman Institute for Fluid Dynamics, Belgium, in 1981, with Honors. I obtained a Doctorate in Applied Sciences with “the highest distinction,” from the Catholic University of Leuven, Belgium, in 1985. From 1987 to the present, I have held various faculty positions at NTUA, including Research Associate in the Laboratory of Thermal Turbomachines, Lecturer, Assistant Professor, and Associate Professor. From 2009 to 2015, I held the position of Secretary General in the Ministry of Environment, Energy, and Climate Change.

5. I have published many articles relating to turbomachinery flow measurements, gas turbine health and performance assessment, analyses of turbofan engines, and heat transfer in turbomachinery, including articles related to geared turbofan engines. From 2004 to 2008, I served as the Vice Chairman and Chairman of the Controls and Diagnostics Committee, International Gas Turbine Institute of the ASME. The Institute is dedicated to supporting the international exchange and development of information to improve the design, application,

manufacture, operation and maintenance, and environmental impact of all types of gas turbines, turbomachinery, and related equipment.

6. A full listing of my publications is included in my curriculum vitae, which I understand has been filed as an exhibit in this proceeding.

III. MATERIALS CONSIDERED

7. I understand that this proceeding involves U.S. Patent No. 9,121,412. In forming my opinions, I have considered, among other things, a Petition for *Inter Partes* Review of claims 1, 2, 4, 5, 7, 8, and 11 filed by General Electric Company (“Petitioner”) dated April 25, 2016, and related exhibits (including the declaration of Dr. Reza Abhari (GE-1003)), an Institution Decision issued by the Patent Trial and Appeal Board on October 27, 2016, and the deposition transcript of Dr. Abhari (UTC-2013), and related exhibits. I have also considered the ’412 patent (GE-1001) and its file history, the Patent Owner’s Preliminary Response, and the exhibits and materials referenced in this declaration. I have also considered the following:

- Exhibit UTC-2001. It appears to be a true and correct copy of an article by L. Thompson, entitled *Gamechanger: How Pratt & Whitney Transformed Itself To Lead A Revolution In Jet Propulsion*, published by Forbes (Jan. 21, 2016), available at

<http://www.forbes.com/sites/lorenthompson/2016/01/21/gamechanger-how-pratt-whitney-transformed-itself-to-lead-a-revolution-in-jet-propulsion/#49e1af53a9e9>;

- Exhibit UTC-2002. It appears to be a true and correct copy of an article by T. K. Grose, entitled *Reshaping Flight for Fuel Efficiency: Five Technologies on the Runway*, published by NATIONAL GEOGRAPHIC (Apr. 23, 2013), available at <http://news.nationalgeographic.com/news/energy/2013/04/130423-reshaping-flight-for-fuel-efficiency/>;
- Exhibit UTC-2003. It appears to be a true and correct copy of an article by L. Krauskopf, entitled *GE Exec says avoided geared design in jet engine battle with Pratt*, published by REUTERS (Sept. 15, 2014), available at <http://www.reuters.com/article/us-general-electric-united-tech-engine-idUSKBN0HA2H620140915>;
- Exhibit UTC-2004. It appears to be a true and correct copy of an article by D. Tsang, entitled *Special Report: The Engine Battle Heats Up (Update 1)*, published by ASPIRE AVIATION (May 10, 2011), available at <http://www.aspireaviation.com/2011/05/10/pw-purepower-engine-vs-cfm-leap-x/>;

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