

UNITED STATES DISTRICT COURT  
FOR THE DISTRICT OF COLUMBIA

UNITED STATES OF AMERICA,  
Department of Justice  
Antitrust Division  
1401 H Street, N.W., Suite 3000  
Washington, DC 20530,

Plaintiff,

v.

RAYTHEON COMPANY,  
141 Spring Street  
Lexington, MA 02173,

and

TEXAS INSTRUMENTS INC.,  
13500 North Central Expressway  
Dallas, TX 75243,

Defendants.

Civil No.: 1:97CV01515

Filed: July 2, 1997

**COMPLAINT**

The United States of America, acting under the direction of the Attorney General of the United States, brings this civil action to obtain equitable relief against defendants and alleges as follows:

1. The United States brings this antitrust case to block the proposed combination of Raytheon Company ("Raytheon") and the Defense Systems and Electronics Unit ("DS&E") of Texas Instruments Inc. ("TI"), the only two firms able to develop and produce an essential input required in state-of-the-art military radar systems valued at about \$10 billion. These radar

systems will be used in major weapon systems being developed in the next few years. Raytheon and DS&E are each others' only competitors in the development and production of these inputs, known as X-band high power amplifier monolithic microwave integrated circuits ("MMICs"). Raytheon is also a leading producer of radar systems. DS&E, on the other hand, is an independent supplier of MMICs, often supplying them to Raytheon's radar system competitors.

2. If Raytheon acquires DS&E, it will obtain a monopoly in high power amplifier MMICs. That monopoly position over a critical input to radar systems will give Raytheon an incentive to refuse to sell, or to sell at disadvantageous terms, to its radar competitors. Unless blocked, this monopoly will likely result in higher costs and less innovation for high power amplifier MMICs, and substantial increases in prices paid by the Department of Defense ("DoD") and ultimately taxpayers for advanced military radars.

#### I. JURISDICTION AND VENUE

3. This action is filed by the United States under Section 15 of the Clayton Act, as amended, 15 U.S.C. § 25, to prevent and restrain the defendants from violating Section 7 of the Clayton Act, as amended; 15 U.S.C. § 18.

4. Both Raytheon and TI develop and produce high power amplifier MMICs for military radars and sell those products to radar manufacturers for use in weapon systems purchased by the Department of Defense, an agency of the United States. Raytheon and TI are engaged in interstate commerce and in activities substantially affecting interstate commerce. The Court has subject matter jurisdiction over this action and jurisdiction over the parties pursuant to Section 12 of the Clayton Act, 15 U.S.C. § 22, and 28 U.S.C. §§ 1331 and 1337.

5. The defendants transact business and are found within the District of Columbia. Venue is proper in this District under 15 U.S.C. § 22 and 28 U.S.C. § 1391(c).

## II. THE DEFENDANTS

6. Raytheon is a Delaware corporation headquartered in Lexington, Massachusetts. Raytheon produces aircraft, guided missiles, space vehicles, radar systems, and defense electronics equipment. It develops and produces high power amplifier MMICs for military radars at its Advanced Device Center in Andover, Massachusetts. In 1996, Raytheon reported total sales of about \$12 billion. Raytheon is also a leading designer and producer of radar systems.

7. TI is a Delaware corporation headquartered in Dallas, Texas. In 1996, TI reported total sales of about \$13 billion. Its DS&E unit produces guided missiles, electro-optical systems, and defense electronics equipment. DS&E develops and produces high power amplifier MMICs for military radars through its RF/Microwave Business Unit at a facility in Dallas, Texas. In 1996, DS&E reported total sales of about \$1.3 billion.

## III. TRADE AND COMMERCE

### A. RELEVANT PRODUCT MARKET

8. High power amplifier MMICs are solid state semiconductor components (commonly referred to as "chips") made of gallium arsenide and used in active electronically scanned array ("AESA") radars. MMICs are designed to operate within specified frequency ranges ("bands") of the microwave spectrum. AESA radars for military air defense, which demand the highest performance MMICs, typically use MMICs operating in the X-band, because

this band offers the best combination of all-weather capability and ability to detect low-level targets.

9. The performance of high power amplifier MMICs is measured by three primary characteristics: power output, bandwidth and power added efficiency ("PAE"). Higher power output provides greater detection range, particularly for objects with low radar cross sections, such as missiles and stealth aircraft. Bandwidth measures the percentage of the spectrum over which the MMIC operates. Wider bandwidth provides better ranging to the target, so that, for example, a missile warhead can be identified and targeted separately from its booster. PAE measures the percentage of input power that is re-emitted; the remainder is waste heat. High efficiency power amplifiers allow radar systems to be built with lower power and cooling requirements.

10. AESA radars are the second generation of phased array radars. Unlike the older dish-type radar antennas, which have to be physically rotated and elevated to scan a given airspace, phased array radars remain stationary while the radar beam is electronically directed over the same area. Phased array radars can, therefore, scan the same airspace much faster and more efficiently, and with a lower probability of detection by an enemy target.

11. AESA radars are a significant improvement over first generation phased array radars, which are passive (rather than active) electronically scanned arrays. Microwave power in an AESA radar is generated in a series of compact, lightweight transmit and receive modules ("T/R modules") containing the MMICs. Passive array radars (as well as dish-type radars), in contrast, use heavy, bulky traveling wave tubes and waveguides. AESA radars are therefore much smaller and lighter than passive arrays. AESA radars also offer superior reliability, since

failures of T/R modules only gradually degrade system performance, while failure of a traveling wave tube disables the radar. Moreover, because power amplifier MMICs are more efficient and thus produce less waste heat than tubes, AESA radars require less power from the engines and generators of the aircraft, ships or other systems in which they are deployed. Power amplifier MMICs are also much less expensive to produce in medium to large production volumes than tubes, resulting in less expensive radars.

12. The Department of Defense ("DoD") has begun the contracting process for several major systems using X-band AESA radars. Among these are the Joint Strike Fighter, the Medium-Extended Air Defense System, the Navy Multifunction Radar and the Theater High Altitude Area Defense System. Competitive radar systems that meet the DoD performance specifications for these projects will require X-band high power amplifier MMICs capable of 8 to 10 watts output, at least 40 percent bandwidth, and at least 50 percent PAE. Because of the importance of the high power amplifier MMIC to the performance of an AESA radar, MMIC capability is an important selection criterion among competing radar systems.

13. Raytheon has produced more high power amplifier MMICs and T/R modules than any other firm. It was chosen in 1992 to supply the power amplifier for the ground-based radar ("GBR") for the Theater High Altitude Area Defense System. Under this program, Raytheon produced and delivered about 42,000 T/R modules containing 6-watt, X-band power amplifiers. In 1996, Raytheon won the development contract for the improved GBR. Raytheon is developing a 10-watt, wide band, high PAE X-band high power amplifier for this program, with a delivery goal of late 1997.

14. TI is the recognized leader in developing high power amplifier MMICs. As a second source to Raytheon on GBR, TI supplied about 28,000 T/R modules containing 6-watt X-band power amplifiers. TI also has been chosen to supply the advanced power amplifiers for the radar on the F-22 fighter; it already has produced 23,000 amplifiers and thousands more will be delivered. TI is very close to production of an X-band 10-watt wide band, high PAE amplifier. It also has developed an X-band 16-watt high power amplifier which is close to meeting DoD specifications.

15. Other products are not realistic substitutes for high power amplifier MMICs. In concept, discrete solid state components can be wired together to perform the functions of a power amplifier MMIC. However, such "hybrid integrated circuits" are larger and heavier than comparable MMICs. Also, because hybrid integrated circuits are less easily and accurately replicated than MMICs, each hybrid integrated circuit requires costly and labor intensive testing and tuning. DoD decided to move away from radar systems incorporating hybrid integrated circuits when it began funding MMIC technology, and it and the radar system manufacturers who are the direct purchasers of MMICs will not return to hybrid integrated circuits in response to a small but significant and non-transitory price increase in high power amplifier MMICs.

16. Although in concept multiple low power amplifier MMICs could be combined to achieve the output power of a single high power amplifier MMIC, such an approach would result in a more costly, heavier, and larger radar system. Moreover, a multichip approach would result in substantially higher production costs for the T/R module. Radar system manufacturers will not accept a combination of low power chips in place of a single high power amplifier MMIC for AESA radars.

17. The development, production and sale of X-band high power amplifier MMICs with output power of eight to ten watts, bandwidth of at least 40 percent, and PAE of at least 50 percent is a line of commerce and a relevant product market within the meaning of the Clayton Act.

#### B. RELEVANT GEOGRAPHIC MARKET

18. High power amplifier MMICs are purchased by radar system producers for inclusion in weapon systems sold to DoD. In sales for DoD weapon systems, radar producers rely on domestic high power amplifier MMIC suppliers. There are no foreign producers to which domestic radar suppliers could turn in the face of a small but significant and non-transitory price increase by domestic high power amplifier MMIC suppliers.

19. The United States is a relevant geographic market within the meaning of Section 7 of the Clayton Act.

#### C. ANTI-COMPETITIVE EFFECT AND ENTRY

20. Raytheon and TI are the only firms capable of developing and producing the high power amplifier MMICs required for military radar bids scheduled for the next two to three years. TI and Raytheon are the only firms that have established production processes and proven manufacturing capability for these high power amplifier MMICs.

21. In the next two to three years, radar programs worth over \$10 billion will be competed. The radars for the Joint Strike Fighter, Medium Extended Air Defense System, Navy Multifunction Radar and the Theater High Altitude Area Defense System, among others, will all require X-band high power amplifier MMICs. Raytheon and TI are the only sources for these critical components.

22. Raytheon's acquisition of TI's DS&E would eliminate all competition in the development, production, and sale of X-band high power amplifier MMICs for military radars being developed over the next two to three years. The proposed acquisition will result in a single supplier with the incentive and ability to raise prices and little or no incentive to minimize cost.

23. The acquisition also likely will result in a lessening of competition in the market for military radars. Raytheon is not only a supplier of high power amplifier MMICs but is also a major supplier of the radar systems of which these devices are critical components. Prior to announcement of the acquisition, TI had teamed with other radar systems suppliers to develop MMICs that met the required specifications for DoD weapon systems. With the acquisition of TI's DS&E, Raytheon will control access to all currently viable high power amplifier MMICs. Raytheon will have an incentive to refuse to sell, or to sell on disadvantageous terms, its state-of-the-art high power amplifier MMICs to its radar competitors. Without access to the latest high power amplifier MMICs, a radar manufacturer is at a serious disadvantage for upcoming military radar competitions.

24. Successful entry into the production and sale of high power amplifier MMICs is difficult, time consuming, and costly. Entry requires advanced technology, skilled engineers, and costly customized equipment. A new gallium arsenide foundry costs over \$50-100 million and takes at least two years to construct. A potential entrant would have to engage in difficult, expensive, and time consuming research to develop designs and production processes that can economically and reliably produce high power amplifier MMICs. These designs and production processes must be perfected in order to successfully bid for a military radar program. It is



unrealistic to expect new entry in a timely fashion to protect competition in upcoming military radar projects.

25. Nor can low power amplifier MMIC producers reposition their product offerings in a timely manner to provide effective competition. Hughes Aircraft Co., Lockheed Martin Corp., Northrop Grumman Corp., and ITT Corp., incumbent firms that have gallium arsenide foundries and experience in low power amplifier MMICs, would need at least two to three years to become effective competitors for high power amplifier MMICs for military radars.

#### D. HARM TO COMPETITION

26. The armed forces of the United States rely on the ongoing, vigorous competition between Raytheon and TI for the development and production of high power amplifier MMICs for military radars. This competition will lead to lower prices for both the radars and the ships, aircraft, and air and missile defense systems incorporating them. The proposed acquisition will lessen competition and create a monopoly in the development and production of high power amplifier MMICs for military radars. Moreover, because Raytheon will likely deprive its radar system competitors of this essential product, the proposed acquisition will also tend to lessen competition substantially among producers of military radars. This will result in an increase in prices paid by the United States for these products and will, therefore, violate Section 7 of the Clayton Act.

#### V. VIOLATION ALLEGED

27. The effect of Raytheon's proposed acquisition of the DS&E unit of TI is to lessen competition substantially and tend to create a monopoly in interstate trade and commerce in violation of Section 7 of the Clayton Act.

28. The transaction likely will have the following effects among others:
- a. competition generally in the innovation, development, and production and sale of X-band high power amplifier MMICs for military radars in the United States would be lessened substantially;
  - b. actual and future competition between Raytheon and TI in the development, production and sale of X-band high power amplifier MMICs for military radars in the United States will be eliminated;
  - c. prices for X-band high power amplifier MMICs for military radars in the United States would likely increase;
  - d. competition generally in development, production and sale of military radars in the United States would be lessened substantially.

#### VI. REQUESTED RELIEF

Plaintiff requests:

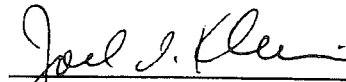
1. That the proposed acquisition by Raytheon of the DS&E unit of TI be adjudged to violate Section 7 of the Clayton Act, as amended 15 U.S.C. § 18;
2. That the defendants be permanently enjoined and restrained from carrying out the Asset Purchase Agreement, dated January 4, 1997, or from entering into or carrying out any agreement, understanding or plan, the effect of which would be to combine the MMIC businesses or assets of Raytheon and TI;


3. That plaintiff be awarded its costs of this action; and
4. That plaintiff have such other relief as the Court may deem just and proper.

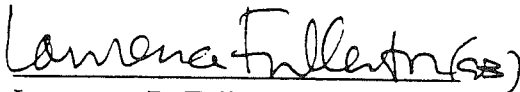
Dated: July \_\_\_\_\_, 1997.

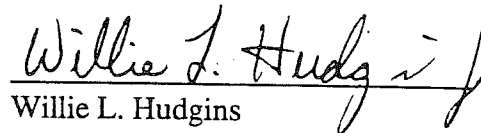
Respectfully submitted,

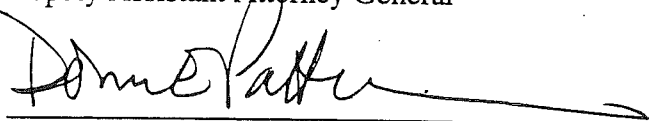
FOR PLAINTIFF UNITED STATES:

  
Joel I. Klein  
Acting Assistant Attorney General

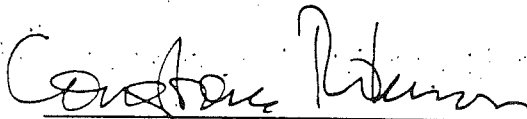
  
J. Robert Kramer II  
Chief, Litigation II Section

  
Lawrence R. Fullerton  
Deputy Assistant Attorney General

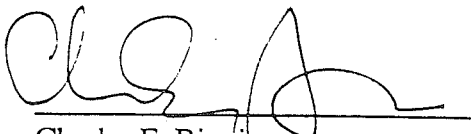
  
Willie L. Hudgins  
Assistant Chief, Litigation II Section

  
Donna E. Patterson  
Counselor to the Assistant Attorney  
General

Robert W. Wilder  
Charles R. Schwidde  
Janet Adams Nash  
Kevin C. Quin  
Melanie Sabo  
Stacy Nelson  
Laura M. Scott  
Tara Higgins  
Nancy Olson

  
Constance K. Robinson (CF)  
Director of Operations

Trial Attorneys  
Department of Justice  
Antitrust Division  
Litigation II  
1401 H Street, N.W.  
Washington, D.C. 20530  
(202) 307-0924

  
Charles E. Biggio  
Senior Counsel to the  
Assistant Attorney General