

Table of Contents

Table of Contents

CHAPTER	PAGE
IV. INVESTIGATION OF AVIATION FUELS BY THE ARMY: INDUSTRY COOPERATION IN MEETING ARMY SPECIFICATIONS, 1928-1932	591
<p>Early Fuel Testing, 591; Benzol Blends, 591; Fundamental Importance of Relation of Engine Temperature to Relative Fuel Behavior, 592; Large Amount of Fuel Testing, 593; Advantages of Supercharger, 594; <i>on the radial engine</i>, 594; <i>the Pratt & Whitney Wasp</i>, 595; Choice of Fuel Components, 595; Army Plan to Use Lead, 595; <i>Army specification using octane number</i>, 596; <i>oil industry meets needs</i>, 597; <i>difficulties with leaded fuels</i>, 597; <i>demand for lead-free high PN fuel</i>, 598</p>	
V. GOVERNMENT AND BUSINESS RELATIONSHIPS IN THE DEVELOPMENT OF AVIATION FUELS, 1932-1938	600
<p>CFR-AFD Programs, 600; Available Components for Producing Fuels, 601; The Role of Isooctane in Producing Superior Fuels, 601; Proposed PWA Project, 602; Efforts at Wright Field to Increase Further Fuel PN, 603; <i>"Army Method" 100 PN fuel</i>, 605; <i>production of 100 PN</i>, 606; <i>conflict of Army General Staff and Wright Field over 100 PN</i>, 607; Development of Methods of Producing Octane, 608; <i>testing of fuel components</i>, 608; <i>diisopropyl ether</i>, 609; <i>octane and heptane in full-scale engine testing</i>, 611; Fuel Behavior at Rich Mixture and Lean Mixture: <i>prejudice against aromatics</i>, 613; <i>British preference for sensitive fuels</i>, 613; <i>rich mixture performance</i>, 614; <i>catalytic cracking process</i>, 615; <i>isopentane</i>, 616; <i>research in pure hydrocarbons</i>, 617; <i>projects of the API</i>, 617; <i>Triptane</i>, 618</p>	
VI. ENGINE DEVELOPMENT FOR USE OF IMPROVED FUELS	620
<p>Exhaust Valves and Spark Plugs: <i>sodium-cooled exhaust valves</i>, 621; <i>development of exhaust valve materials</i>, 621; <i>development of spark plugs</i>, 622; Superchargers and Propellers: <i>need for supercharger development</i>, 626; <i>British experience with superchargers</i>, 626; <i>two-speed superchargers</i>, 627; <i>exhaust turbosupercharger</i>, 628; <i>controllable pitch propellers</i>, 628</p>	
VII. AVIATION FUEL DURING WORLD WAR II	631
<p>United States Capacity for Production of 100 PN Fuel, 631; Organization for War: Government and Industry, 631</p>	

CHAPTER	PAGE
VIII. RELATIONSHIP OF GOVERNMENT AND BUSINESS AFTER 1941 IN FUEL DEVELOPMENT	637
<p>British Determination of Lean and Rich Mixture Quality, 637; British Use of Supercharged Laboratory Engines, 637; Grade 100/125, 638; The Aromatic Problem: <i>cat-cracked gasoline</i>, 639; <i>self-sealing tanks</i>, 640; <i>aromatics blamed for all aircraft operating difficulties</i>, 641; <i>aromatic amines</i>, 641; <i>Xylidine</i>, 642; <i>engine operating difficulties with xylidine</i>, 643; <i>grade 100/150</i>, 644; <i>controversy over fuels containing xylidine</i>, 645; <i>severe and mild United States engines using xylidine</i>, 645; <i>effect of xylidine on production of super fuel</i>, 646; Supplementary Injection of Water or Water-Alcohol, 646: <i>at Wright Field</i>, 647; <i>"Anilol"</i>, 648; <i>European and other developments</i>, 648; <i>Pratt & Whitney water injection development</i>, 648; <i>patents on water injection</i>, 650; Grade 115/145, 651; <i>Army and Navy interest in fuels with improved lean performance</i>, 652; <i>effect of engine design on performance at lean mixtures</i>, 653.</p>	
IX. WARTIME PRODUCTION SOLUTIONS	655
<p>HF Alkylation, 655; Isomerization, 655; Hydroforming, 655; Triptane, 656; <i>General Motors triptane plant</i>, 657; <i>triptane the best potential aviation fuel</i>, 657; <i>triptane's contribution to knowledge of fuel behavior</i>, 658.</p>	
X. MAGNITUDE OF THE AVIATION FUEL MANUFACTURING PROBLEM	659
<p>Fuel Production, 659; Conflicts Among the Interested Groups, 659; Volatility v. Supply, 660.</p>	

TECHNICAL APPENDICES

A THE TECHNICAL DISPUTE OVER COOLING, BY ROBERT SCHLAIFER	665
<p>Weight at Moderate Altitudes, 666; Performance at High Altitude, 672; Comparison of the Weights of an Air-Cooled and a Liquid-Cooled Fighter Power Plant in World War II, 676; Drag, 678; <i>cooling drag</i>, 681; <i>form drag</i>, 681; Greater Power from a Single Engine, 684; Maintenance, Reliability, and Durability, 689; Vulnerability: Capacity for Overload, 690</p>	

Table of Contents

CHAPTER	PAGE
B HYDROCARBONS AND CHEMICAL COMPOUNDS USED IN AVIATION FUELS, BY S. D. HERON	693
Paraffins, 694; Forms of Linkage, 697; Olefins, 698; Aromatics, 699; Other Fuel Compounds: <i>alcohols</i> , 700; <i>ethers</i> , 701, <i>aromatic amines</i> , 701; <i>lead antiknock compound</i> , 702; Manufacture of Isooctanes: <i>original processes used by Edgar</i> , 703; <i>hot acid and phosphoric acid processes</i> , 703; <i>alkylation process</i> , 704	
INDEXES (airplanes, engines, general)	707