Missions for America
Semper vigilans!
Semper volans!

The Coastwatcher

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Connecticut Wing
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LtCol Stephen Rocketto, Editor
srocketto@aquilasys.com

C/A1C Virginia Poe, Reporter
Lt David Meers & Maj Roy Bourque, Papparazis

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SCHEDULE OF COMING EVENTS

18 FEB-Safety Down Day-Commander's Call
22 FEB-CTWG SAREX-HFD
25 FEB-TRCS Meeting

01 MAR-CTWG Pilot Meeting-MMK
05 MAR-CTWG Commander's Call
13-15 MAR-CTWG Staff Assisted Visit
19 MAR-CTWG Staff Call
29-30 MAR-CTWG West Group SLS-DXR

19 APR-CSRRA AR-15 Rifle Rifle Clinic
26 APR-04 May-NER Mission Aircrew School
29 APR-Wing Wide SAREX-GON

10-11 MAY-CTWG East Group CLC-HFD
17 MAY-Commander's Cup Rocketry (tentative)
17-18 MAY-Quonset Airshow

16-21 JUN-Tri-State SAREX (CT/RI/MA)
19 JUL-02 AUG-Nat'l Emergency Services Acad.
08-16 AUG-CTWG Encampment-Camp Niantic
23 AUG-Wing Wide SAREX-HFD
01 OCT-CTWG Commander's Call and CAC
17-19 OCT-CTWG.NER Conference
18-25 OCT-NER Staff College-New Jersey
20 SEP-Cadet Ball-USCGA (tentative)

CADET MEETING

11 February, 2014
submitted by
C/A1C Virginia Poe

The cadet squadron has been divided into two flights. C/Capt Schultz is Cadet Commander. Alpha Flight will be commanded by C/CMS Ray assisted by Flight Sergeant C/CMS Johnstone. C/CMS Trotochaud will command Bravo Flight and C/SMS VanDevander will be Flight Sergeant. Squadron First Sergeant is C/CMS Carter.

C/CMS Carter briefed the cadets on fire safety.

C/2Lt Tynan explained the structure of the cadet program and cadet and senior member ranks.

SENIOR MEETING

11 February, 2014
submitted by
Canis Major Constance St. Bernard

Commander's Call

Capt Farley presented a short course on the knowledge needed by Skills Evaluation Trainers (SET). At the conclusion of the regular meeting, LtCol deAndrade administered the Operations Qualification Approval Procedures Training test to the SET cadre.

Maj Noniewicz announced that the Squadron will hold a Safety Down Day directed by Lt Dickenson. Lt Dickenson stated that the training will incorporate six topics from the CTWG safety syllabus.

Maj Bourque and the Facilities Committee will determine what maintenance work is necessary and schedule a field day in the early spring.

The on-line “Van Safety Awareness” course was explained.

Lt Dickenson presented the monthly safety briefing. The first topic alerted pilots to the deterioration of skills and situational awareness due to reliance on automated systems. The second topic reviewed the steps necessary to respond appropriately to a power outage.

Lt Dickenson explained how to complete the new weekly aircraft status form and noted that copies will be placed in the aircraft.

Lt Meers noted that the cadets need an indoor area of winter drill practice and solicited suggestions from the officers.

Lt Simpson will be compiling an up-to-date list of building, automobile, and aircraft key-holders.

TRCS AIRCREW PROFICENCY FLIGHTS

Squadron aircrews have been engaging in a series of proficiency flights with the goal of improving their skills in utilizing the G1000 navigation features as search and rescue tools for grid, sector, and creeping line search patterns.

LtCols Kinch and Rocketto, Majs Noniewicz and Neilson, and Capt Farley have been working on programming the multi-function display panel in the Cessna 182s to ease the pilot workload and increase precision during SAR missions

AEROSPACE CURRENT EVENTS

Saving Fuel

The high price of petroleum based fuels have forced the industry into researching ways in which fuel consumption can be reduced.

Traditionally, in aircraft powered by reciprocating engines, this has been done by leaning the mixture and selecting the best throttle and propeller setting for the density altitude as defined in the pilot operating handbook.

Both the military, airlines, and business aviation face a similar problem with the turbine powered aircraft which they customarily fly. One method which has some potential to reduce fuel costs is substituting blended fuels or exotic fuels for the petroleum based jet fuels. Experiments have been done using hydrogen and blends of vegetable oils and petroleum products but the jury is still out.

Recently, two concepts are under study. The first is the use of high aspect ratio wings such as those used on competitive gliders. This means building wings whose span is large relative to its chord. But problems arise with very long wings.

This CAP Super Blanik glider has an aspect ration of 14.
(photo credit: Paul Noniewicz)

When the military is interested in cruising for long periods of time at high altitudes, they turn to high aspect ratio wings also. The U-2's aspect ratio is round 11 and the WB-57 is about 8.

Lockheed's U-2 is sometimes referred to a a powered glider.

And the lesser known Martin WB-57F

Fighters are often found with wings exhibiting low aspect ratios. The run from 2.4 for the Starfighter to 3.5 for the F/A-18.

Lockheed CF-104D Starfighter

Or the F/A-18s flown by the Blue Angels and the F-16s flown by the Thunderbirds.

A conventional wing is basically a cantilever beam, supported only at the attachment points on the fuselage. The length of the wing causes a bending moment around the hinge and this can lead to flutter and structural failure.

One solution is to use a strut to support the wing as is done on the Cessna 172 and 182 flown by CAP.

A deHavilland of Canada DHC-3 Otter, converted to turbine power and mounted on floats illustrates a high drag configuration. The drag created by the wing struts, pontoons and their supporting trusses, and the boarding ladder are partially offset, but not by much, by the powerful P&W Canada PT-6's smaller frontal area when compared to its original P&W radial engine.

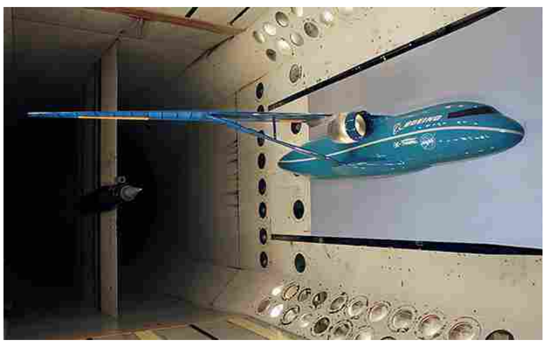
A variation on the below wing lift struts shown on the Otter are the above wing struts used on the Piper PA-25 Pawnee. When the aircraft is on the ground, the struts support the weight and are in tension. In flight, the wings lift and a compressive load is applied to the struts. The forces in the lift struts of the Otter are opposite in direction.

Note too the use of wires to brace the tail. Wires cannot support compressive loads so the Pawnee requires their employment both above and below the horizontal stabilizers.

The drag of the non-retractable landing gear subtracts from fuel efficiency but the operational requirements of the Pawnee make little demand on fuel efficiency and a large demand on strength and ease of maintenance.

The Pawnee, commonly used in aerial spraying and glider towing, was designed by the remarkable Fred Weick.

Some recent design work indicates that companies such as Boeing are considering the use of trusses for airliners. The fuel advantage of the high aspect ratio wing may offset the drag penalty of external bracing.



A Boeing-NASA Model under test (photo credit: Boeing)

But in physics, there is no free lunch. The additional structural material and its location induces weight and drag penalties but careful design and novel materials could mitigate these disadvantages. A lot of testing will be needed to validate the theoretical models which will be fed into the computers.

A second problem arises because a very long wing will undoubtedly cause troubles docking the aircraft. First, the military will have concerns about the larger footprint of a high aspect ratio cargo aircraft. Space on hardstands can be limited and during a surge caused by a crisis, can impede the flow of troops and material.

The airlines face an allied problem. The gates at many airports might be too narrow to accommodate very long wing spans. Allow for a buffer for clearance and ground vehicle access, a Boeing 737 needs a gate around 125 feet wide. The Airbus 380 might require a 300 foot width, the length of a football field.

A solution would be to make the wings folding *à la* those on aircraft carriers. Once again, this adds weight and mechanical complexity which translates into cost.

Boeing will offer its new 777X with folding wingtips. Preliminary data indicates that the span is flight will be around 233 feet and will reduce to 213 on the ground. Boeing would wish to make the 777X compatible with a many airports as possible. A Boeing 747, one of the largest planes of the older generation has a 200 foot wingspan so most large airports are fitted to accept this size.

Boeing Illustration of 777X Folding Wing Tips

Approximately 25%-35% of an airline's operating expenses is the cost of the fuel. Delta average fuel cost is around 10 billion dollars/year. The airline operates its own oil refinery in Trainer, Pennsylvania. One figure states that this saves Delta 300 million dollars each year.

The fuel cost is governed not only by the cost of the fuel by by other factors such as the efficiency of the aircraft, the airlines route structure, weather, and air and ground traffic control. But a savings as small as 1% would amount to 10 million dollars in extra income. And so, the airline's financial bean counters and technical gurus have mounted a quest for a “Holy Grail” from which they seek to drain the last dregs of liquid fuel energy.

AEROSPACE HISTORY

Notes on the History of Improving Aircraft Efficiency

The efficiency of aircraft design was a problem faced by the early pioneers in aviation. The Wright brothers successful experiments in propeller design were critical in their success to achieve powered flight. Weight was always an issue, especially in regard to the power source. Compressed air, steam, and sheer human muscle were all tried but all paled in comparison to the energy available from petroleum fueled internal combustion engines.

The offering of handsome financial prizes for records in speed, altitude, and distance serves to motivate the designers. The *Grande Semaine d'Aviation de la Champagne* was an aviation meet held at Rheims, France in 1909. Prizes as high as 10,000 Francs were offered for speed, payload, altitude, and range. That sum is approximately equal to $40,000 today. Lindbergh's New York to Paris flight won the $25,000 Oertig Prize which might be worth around $300,000 today. And consider the 10 million dollar Ansari X Prize won by Rutan's SpaceShipOne after a 100 million dollar investment so crass and immediate financial gain is not the only reason for the pursuit of prizes. Other rewards accrue, from a place in history to the endorsement of a wristwatch.

The creation of high octane gasoline allowed piston engines to burn fuel more efficiently by allowing for higher pressures within the cylinders while avoiding pre-detonation or "knocking." Shell Oil and one if its vice-president's, a racing pilot and military reservist named Jimmy Doolittle, were key players in high octane fuel development and production.

Fuel efficiency pays off in range, endurance time, and lower costs but the interplay with other factors are complex.

Engines could be equipped with superchargers. They then burned more fuel but the extra power allowed more fuel to be carried so range increased and they allowed high altitude flight in less dense air, an advantage also enjoyed by jet propelled aircraft. High altitude requires less cruising fuel and the ability to take advantage of favorable higher winds.

A second method which has had minor success is thrust augmentation. This involves tinkering with the power-plant system. Aircraft such as the P-51 Mustang used the Meredith Effect to provide thrust to offset the drag caused by the protruding ventral radiator.

Charlie Blair's Excalibur III record setting P-51C in which he explored the possibilities of the jet stream and over-the-pole flying. Note carefully the ventral radiator configuration designed to take advantage of the Meredith Effect.

Convair provided an exhaust thrust augmentor on their 240 series airliners which added 10 knots to the airspeed without increasing fuel consumption

Convair 240 in Western Airlines livery at Chino. Note the double exhausts on the aft end of the starboard nacelle which comprised part of the thrust augmentation system.

Drag reduction is a major source of operating efficiency. Radial engines which incorporated the Townend Ring or the NACA cowling exhibited better engine cooling, drag reduction, and a consequent increase in fuel efficiency.

Above, Boeing's engineers utilized the British Townend Ring when the designed the P-26 Peashooter, the first production monoplane fighter accepted by the USAAC. Below, Jack Northrop, working for Lockheed designed the Model 5 Vega using a NACA cowling. Wiley Post set a solo round the world record in this aircraft and explored flight in the stratosphere using is a personally designed pressure suit.

The of Richard Whitcomb produced three such breakthroughs: the Coke-bottle fuselage, winglets, and the super critical wings.

Grumman's F11F Tiger exhibits the features of the "area rule" design. The "Coke bottle" shape maintains a constant cross sectional area for the aircraft which inhibits flow separation in the trans-sonic range.

The now ubiquitous winglets, displayed on this Delta Airlines Boeing 737-832 reduce the intensity of the wing-tip wake vortices created by the difference of pressures on the top and bottom surfaces of the wing. Consequently, reducing energy loss and bettering fuel efficiency.

Wave drag in the trans-sonic region robs energy for the aircraft and costs fuel. The super critical airfoil reduces these loses and provides extra lift as a bonus. NASA used a converted Vought TF-8A Crusader was used as a testbed at the Dryden Facility. The McDonnell-Douglas C-17 Globemaster III takes advantage of this advance in wing design.

Flush riveting, filleting, and removal of modification of external appendages such as struts, bracing wires, and antennae have all worked well.

What is in question is whether advances in materials, chemistry, and aerodynamics can keep pace with the rising price of a barrel of oil.