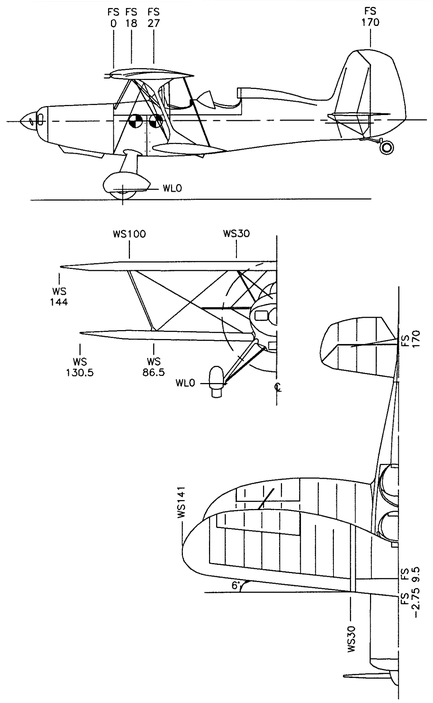


ENGINEER	AIRCRAFT GEOMETRY STOLP STARDUSTER CORPORATION	PAGE	1-1
CHECKER		DATE	6-1-98

LEGEND:

(1) PART NUMBER

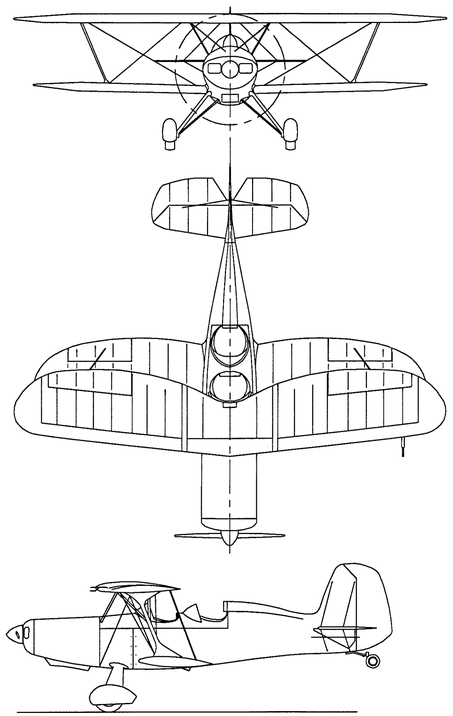
[1] REFERENCES TO ANOTHER SHEET
SEE NOTE

⚠ REVISION

OPTION: SOMETHING THAT CAN BE DONE BUT NOT NECESSARY TO CHANGE.

NOTE: READ AND EVALUATE

INDEX OF SHEETS:



THE STARDUSTER TOO WAS BUILT TO FILL A NEED FOR A REASONABLY SIZED TWO PLACE OPEN SPORT BIPLANE. IT WAS BUILT TO FLY JUST FOR FUN AND IS NOT INTENDED TO BE AN AEROBATIC MACHINE. IT IS QUITE STRONG, HOWEVER, AND STABILITY IS GOOD. THE LIGHT WING LOADING MAKES SLOW LANDING SPEED SHORT FIELD OPERATION VERY GOOD. THE FUSELAGE, TAIL, LANDING GEAR, ENGINE MOUNT, STRUTS, ETC. ARE MADE OF WELDED 4130 STEEL TUBING. THE WINGS HAVE SPRUCE SPARS WITH RIBS MADE OF 1/4" PLYWOOD. CONSTRUCTION OF THE PLANE HAS BEEN KEPT AS SIMPLE AS POSSIBLE AND IT GOES TOGETHER PRETTY WELL. THE DRAWINGS FOR THIS PLANE ARE PRINTED ON AN OFFSET PRESS SO THEY WILL NOT FADE OR SHRINK. THE PRINTS ARE VERY COMPLETE WITH RIBS AND MOST FITTINGS FULL SIZE WHICH SAVES CONSIDERABLE TIME ON CONSTRUCTION OF THESE PARTS. THESE PLANES HAVE BEEN CONSTRUCTED WITH ENGINES RANGING FROM 145 TO 260HP, HOWEVER, THE 180HP VERSION IS THE ONLY ONE SHOWN IN THE DRAWINGS. RAW MATERIALS SUCH AS 4130 TUBING AND SHEET, PLYWOOD, HARDWARE, AS WELL AS FUEL TANKS, NOSE COWL, WIND-SHIELDS, WHEEL PANTS, ETC. ARE IN STOCK AND AVAILABLE AT ALL TIMES. THE SA300 IS A SMALL AIRPLANE BUT BY NO MEANS A LITTLE ONE. IT IS LARGE ENOUGH TO DO THE JOB EXPECTED OF IT. IT IS EASY AND FUN TO FLY. THE PLANE HANDLES WELL ON THE GROUND AS WELL AS IN THE AIR.

THE STARDUSTER TOO IS A FINE BIRD AND A JOY TO OWN.

THANK YOU

SA-300 MATERIAL LIST

SHEET NO. 2 = LOWER WING LH & RH
SHEET NO. 3 = UPPER WING LH & RH
SHEET NO. 4 = WING SPARS
SHEET NO. 5 = TRAILING EDGE & WING TIPS
SHEET NO. 6 = CENTER SECTION & WING FITTINGS
SHEET NO. 7 = AILERONS
SHEET NO. 7A = FORWARD-MOUNTED AILERON SLAVE STRUT
SHEET NO. 8,8A = RIBS
SHEET NO. 9 = FUSELAGE FAIRINGS
SHEET NO. 10 = VERTICAL FIN, RUDDER, STABILIZER & ELEVATOR
SHEET NO. 11 = FUSELAGE
SHEET NO. 12 = CABANES & "I" STRUTS
SHEET NO. 13 = CONTROLS
SHEET NO. 14 = LANDING GEAR
SHEET NO. 15 = GENERAL ARRANGEMENT
SHEET NO. 16 = FUEL SYSTEM, BRAKE LINE & SEATS
SHEET NO. 18 = SHEET METAL FIREWALL, COAMING
SHEET NO. 19 = ENGINE COWLING
SHEET NO. 20 = CENTER SECTION WITH FUEL TANK

AERODYNAMIC AND STRUCTURAL ANALYSIS OF THE STARDUSTER TOO AIRCRAFT

PREPARED FOR

MR. L STOLP
CORONA, CALIFORNIA

PREPARED BY

WILLIAM H. WEST
DECEMBER 31, 1969

INTRODUCTION

THE ANALYSIS OF THE "STARDUSTER TOO" AIRCRAFT PRESENTED HEREIN, WAS UNDER-TAKEN AT THE REQUEST OF THE DESIGNER, MR. L STOLP, TO VERIFY THE PRELIMINARY ESTIMATES USED IN PREPARING THE DESIGN AND TO INSURE THE STRUCTURAL INTEGRITY OF THE AIRCRAFT WAS VALID FOR ALL GOVERNMENT SPECIFIED FLIGHT CONSTRUCTION.

SINCE THE ANALYSIS WAS PREPARED FOR AN EXISTING AIRCRAFT AND IS TO VERIFY THE STRUCTURE OF THE AIRCRAFT, RATHER THAN BE USED AS A DESIGN GUIDE, THE CRITICAL FLIGHT CONDITION SELECTED IMPOSES MATHEMATICALLY GREATER LOADS THAN THE AIRCRAFT WILL EXPERIENCE IN FLIGHT. THE ANALYSIS IS THEREFORE CONSERVATIVE IN ITS APPROACH.

WILLIAM H. WEST

SECTION 1
BASIC AIRCRAFT DATA

THE BASIC AIRCRAFT DATA HAS BEEN TAKEN FROM BOTH THE AIRCRAFT DRAWINGS AND FROM PREVIOUSLY CONDUCTED PERFORMANCE ANALASYS. THIS PERFORMANCE DATA HAS BEEN PROVEN TO BE IN CLOSE AGREEMENT WITH ACTUAL FLIGHT DATA, AND PROVIDES THE BASIS FOR SELECTION OF THE CRITICAL FLIGHT VELOCITIES.

FOR REFERENCE THE AIRCRAFT HAS BEEN DIVIDED INTO FUSELAGE STATIONS, WING STATIONS, AND WATER LEVEL STATIONS. THE DATUM PLANE FOR THE FUSELAGE STATIONS. FOLLOWS THE PERFORMANCE DATA ANALYSIS IN SELECTING THE FIREWALL AS THE 0 DATUM PLANE. ALL FUSELAGE STATIONS AFT OF THE DATUM PLANE ARE POSITIVE AND ARE MEASURED IN INCHES. THE WATER LEVEL 0 STATION HAS BEEN SELECTED AS THE CENTER LINE OF THE MAIN WHEEL AXLE. STATIONS ABOVE THIS LEVEL ARE POSITIVE.

THE WING STATIONS ARE MEASURED FROM THE CENTER LINE OF THE AIRCRAFT AND ARE ASSUMED POSITIVE IN EITHER DIRECTION BECAUSE OF THE AIRCRAFT SYMMETRY. A SLIGHT DEVIATION WAS MADE IN SELECTING WING STATIONS FOR THE UPPER WING BECAUSE OF THE REARWARD SWEEP. WING STATIONS USUALLY ARE MEASURED TO THE 25% CHORD LINE, AND BUTT (BUTTLOCK) PLANES ARE PARALLEL TO CENTER THE CENTERLINE. HOWEVER, BECAUSE OF THE SMALL DEGREE OF SWEEP BACK (6°) BUTT PLANES AND WING STATIONS ARE CONSIDERED TO BE SYNONYMOUS.

STARDUSTER TOO PERFORMANCE DATA

SPAN, UPPER WING	24'-0"
SPAN, LOWER WING	21'-9"
INCIDENCE ANGLE, UPPER WING	0"
INCIDENCE ANGLE, LOWER WING	1"
DECALAGE	-1"
DIHEDRAL, UPPER WING	0°
DIHEDRAL, LOWER WING	1-1/2°
CHORD AT MAXIMUM POINT	48.0"
CHORD AT MAC	44.0"
WING GAP	47.0"
STAGGER AT MAXIMUM CHORD POINT	+ 20.4"
WING AREA	165 ft^2
AIRFOIL	M-6
AIRFOIL ASPECT RATIO (THICKNESS/CHORD)	.120
THICKNESS/CHORD (FORM-6)	.120
WING LOADING AT MAXIMUM GROSS	10.33 #/ft^2
LENGTH, OVERALL	20'-7"
HEIGHT, OVERALL	7'-3"
G's, DESIGN LIMIT	± 6.0
G's ULTIMATE	± 9.0
FUEL CAPACITY: WITH WING TANK 16.7	45 GAL.
WITHOUT WING TANK 28	28 GAL.
ENGINE, LYCOMING O-360-A1A (PREFERRED)	180 -200 HP
RECOMMENDED ENGINE HP RANGE	150 TO 300 HP
POWER LOADING AT MAXIMUM GROSS	9.47 lbs./HP
WEIGHT: EMPTY (WITH ENGINE OIL)	1,000 lbs.
FUEL (45 gal. @ 6.5 lbs./gal.)	293 lbs.
PASSENGERS (2 @ 175 lbs/EACH)	350 lbs.
BAGGAGE & MISC.	61 lbs.
MAX. AEROBATIC GROSS WEIGHT	1,704 lbs.
CG: MAX. FORWARD FROM FIREWALL	18.0"
MAX. AFT OF FIREWALL	27.0"
STALL SPEED @ 1,757# Vs	56 MPH
MAXIMUM SPEED Vne	180 MPH
MAXIMUM STRUCTURAL SPEED Vno	180 MPH
CRUISE SPEED @ 75% POWER Vo	134 MPH
CRUISE SPEED @ 65% POWER Vo	122 MPH
MANEUVERING SPEED Va	105 MPH
BEST GLIDE	70 MPH
BEST GLIDE ANGLE	6-1/2°
ABSOLUTE CEILING	23,000'
BEST ANGLE OF CLIMB SPEED Vx	70 MPH
BEST RATE OF CLIMB SPEED Vy	83 MPH
BEST RATE CLIMB: SEA LEVEL	1,500'/MIN.
5000' MSL	1,060'/MIN.
10,000' MSL	810'/MIN.
CONTROL MOVEMENT: AILERONS	+30° -18°
ELEVATORS	+30° -25°
RUDDER	±25°

DATA COMPILED WITH LYCOMING O-360-A1A, 180HP ENGINE.

SMALLEST KNOWN ENGINE= 125 HP
LARGEST KNOWN ENGINE= R-985 450 HP

STRENGTH OF THE STARDUSTER TOO

THE STRENGTH OF AN AIRCRAFT, i.e., ITS ABILITY TI WITHSTAND NORMAL AERO-DYNAMIC FORCES AS WELL ASS THOSE ADDITIONAL FORCES DUE TO GUSTS, MANEUVERING OR LANDING IS USUALLY EXPRESSED IN TERMS OF A FACTOR OF THE ACCELERATION OF GRAVITY. THUS, AN AIRCRAFT MAY BE SAID TO WITHSTAND 5 or 6 G's, MEANING 5 OR 6 TIMES THE NORMAL ACCELERATION OF GRAVITY. THIS FACTOR IS USED IN DETERMINING THE LOADS. ON AN AIRCRAFT BY MULTIPLYING THE GROSS FLYING WEIGHT OF AN AIRCRAFT BY THE G FACTOR.

THE G FACTOR IS FURTHER DEFINED BY THE TERMS "LIMITS" AND "ULTIMATE". THE LIMIT LOAD IS THAT MAXIMUM LOAD WHICH WILL STRESS THE MATERIAL OR STRUCTURE TO ITS ELASTIC LIMIT. IF THIS LOAD IS REMOVED, THE MATERIAL WILL RETURN TO ITS ORIGINAL DIMENSION. ANY LOAD IN EXCESS OF THIS "LIMIT" WILL CAUSE A PER-MANENT DEFORMATION OR "SET". THE "ULTIMATE" LOAD IS THAT MAXIMUM LOAD WHICH IF EXCEEDED WILL CAUSE FAILURE OF THE MATERIAL OR STRUCTURE.

THEREFORE, IF AN AIRCRAFT IS SPECIFIED TO BE A 6 G LIMIT AND 9 G ULTIMATE. AIRCRAFT, IT IMPLIES THAT THE AIRCRAFT CAN BE SAFELY FLOWN THROUGH MANEUVERS THAT WILL IMPOSE LOADS EQUAL TO 6 TIMES ITS NORMAL WEIGHT WITHOUT DEFORMING (STRETCHING, BENDING, ETC.) ITS STRUCTURAL. IT CAN ALSO BE FLOWN THROUGH ACCELERATIONS EQUAL TO 9 TIMES ITS NORMAL WEIGHT WITHOUT FAILURE OF THE STRUCTURE. THE ABILITY OF AN AIRCRAFT TO WITHSTAND THE LIMIT AND ULTIMATE LOAD ARE STATED BY "MARGINS OF SAFETY". THE MARGIN OF SAFETY IS THE PERCENTAGE DIFFERENCE BETWEEN THE ACTUAL LOAD APPLIED TO A PARTICULAR STRUCTURAL COMPONENT AND MAXIMUM LOAD THAT A MEMBER CAN WITHSTAND. LIMIT MARGINS OF SAFETY ARE THEREFORE THE PERCENTAGE DIFFERENCE BETWEEN THE ACTUAL LOAD AND THE ELASTIC LIMIT OF THE STRUCTURAL MEMBER. ULTIMATE MARGINS OF SAFETY ARE THE PERCENTAGE DIFFERENCE BETWEEN 1.5 TIMES THE ACTUAL LOAD AND THE FAILURE LOAD OF THE STRUCTURAL MEMBER.

CRITICAL FLIGHT CONDITIONS AND LOAD FACTORS FOR THE STARDUSTER TOO

THE STARDUSTER TOO IS A 6 G LIMIT, 9 G ULTIMATE AIRCRAFT IN BOTH NORMAL AND INVERTED FLIGHT. THE CRITICAL, i.e., MAXIMUM LOADS ARE IMPOSED BY CONDITION I - A SUDDEN PULL UP TO MAXIMUM ANGLE OF ATTACK AT MAXIMUM LEVEL FLIGHT AND CONDITION V - INVERTED FLIGHT AT MAXIMUM ANGLE OF ATTACK.

CONDITION I - 6 G LIMIT, 9 G ULTIMATE.

CRITICAL MEMBER - SPAR TO CENTER SECTION ATTACH FITTING - PART NO. 41
CRITICAL IN BEARING STRESS.
MARGIN OF SAFETY (BEARING ULTIMATE) = .02.
ACTUAL ALLOWABLE ULTIMATE G FACTOR AT 0 MARGINS IS 9.18 G's.
THE SECOND MOST CRITICAL MEMBER IS THE FRONT SPAR ACTING UNDER COLUMN LOAD.
MARGINS OF SAFETY (COLUMN ULTIMATE) = .18
ACTUAL ALLOWABLE ULTIMATE G FACTOR AT 0 MARGIN IS 10.6 G's
MINIMUM COMPONENT FOR LIMIT LOAD FACTOR IS SPAR BENDING UPPER WING FWD SPAR AT THE INTERBAY STRUT ATTACH POINT.
MARGIN OF SAFETY (LIMIT) = .29
ALLOWABLE ACTUAL LIMIT G FACTOR AT 0 MARGIN IS 7.74 G's.

CONDITION V INVERTED FLIGHT

THE LIMITING COMPONENT FOR INVERTED FLIGHT IS THE STRESS IN THE LANDING WIRED ACTING AS FLYING WIRES.
MARGIN OF SAFETY (LIMIT) = .95
ACTUAL ALLOWABLE G FACTOR AT 0 MARGIN IS 8.27 G's.
MARGIN OF SAFETY (ULTIMATE) = .50
ACTUAL ALLOWABLE G FACTOR AT 0 MARGIN IS 10 G's

THE ABOVE INFORMATION INDICATES A REASONABLY STRONG AIRPLANE, BUT IT IS NOT INTENDED TO BE AN AEROBATIC AIRCRAFT. ALSO, TAKE NOTE THAT THE STRESS INDICATED WAS RUN AT 1704 LBS., WHICH WAS THE WEIGHT OF THE ORIGINAL STARDUSTER TOO WITH A 180HP LYCOMING ENGINE, FIXED PITCH PROPELLER AND NO ELECTRICAL SYSTEM. ADDED WEIGHT WILL EFFECT BOTH THE STRESS AND PERFORMANCE OF THE AIRPLANE.

GENERAL NOTES:

A. WE HAVE TAKEN THE ORIGINAL DRAWINGS AND PUT THEM ON AUTOCAD.
WE HAVE SHOWN OPTIONS AND CLARIFICATIONS.
WE HAVE ATTEMPTED TO FILL-IN MISSING DATA AND PROVIDE HELPFUL NOTES.
PLEASE FORWARD COMMENTS OR SUGGESTIONS. WE WILL EVALUATE AND UPDATE DRAWINGS.

LES HOMAN
1-12-99

B. PRIOR TO CUTTING , SHAPING, DRILLING, DOUBLE CHECK PLANS, DIMENSIONS AND WHERE PART IS TO FIT IN.

C. THESE PLANS ARE PROVIDED FOR EDUCATIONAL AND LEARNING PURPOSES ONLY. ANY AIRCRAFT OR COMPONENT(S) BUILT FROM THESE PLANS IS DONE SO SOLELY AT THE BUILDER'S RISK AND RESPONSIBILITY.

D. THESE ARE APPROXIMATELY 1200 EXAMPLES OF THIS AIRCRAFT FLYING AND MANY MORE UNDER CONSTRUCTION. WE RECOMMEND AND WILL BE HAPPY TO ASSIST YOU IN GETTING IN CONTACT WITH THOSE BUILDERS AND PILOTS IN YOUR AREA.

#2562

REVISION:		DATE:
1		6/2/99

Sheet No. 1	Starduster Too Model SA300	
DRAWN BY: 6/1/98	SPECS & STRESS ANALYSIS	
DESIGN BY:		

129 Chuck Yeager Way, Oroville, CA 95965
PHONE:530-534-7434 FAX:530-534-7451
WEB SITE: www.starduster.com