

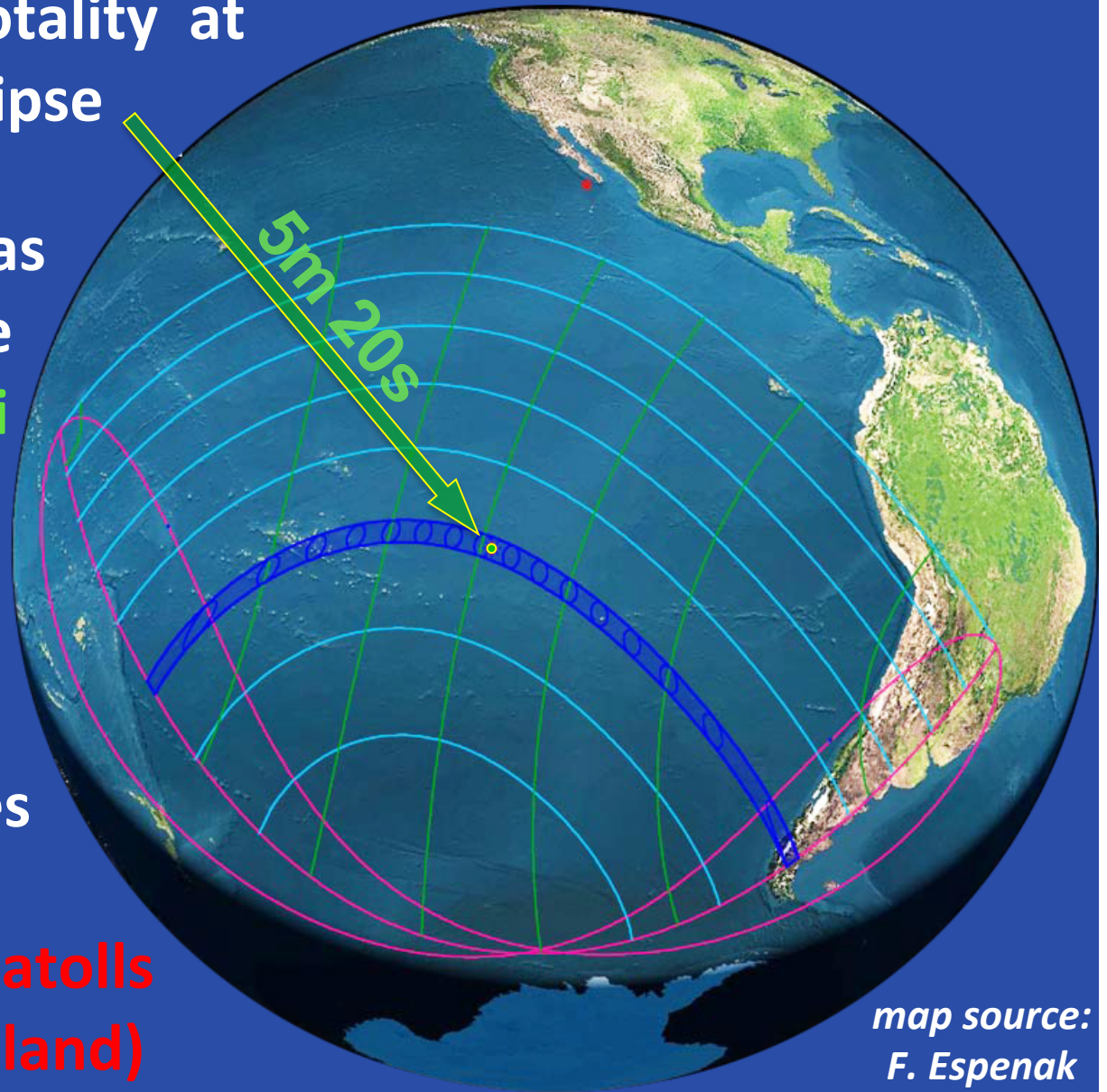
TSE 11 JULY 2010 (354 days later)

- Another very long totality at point of greatest eclipse

- But, in mid-Ocean was not readily accessible
2500 km from Tahiti

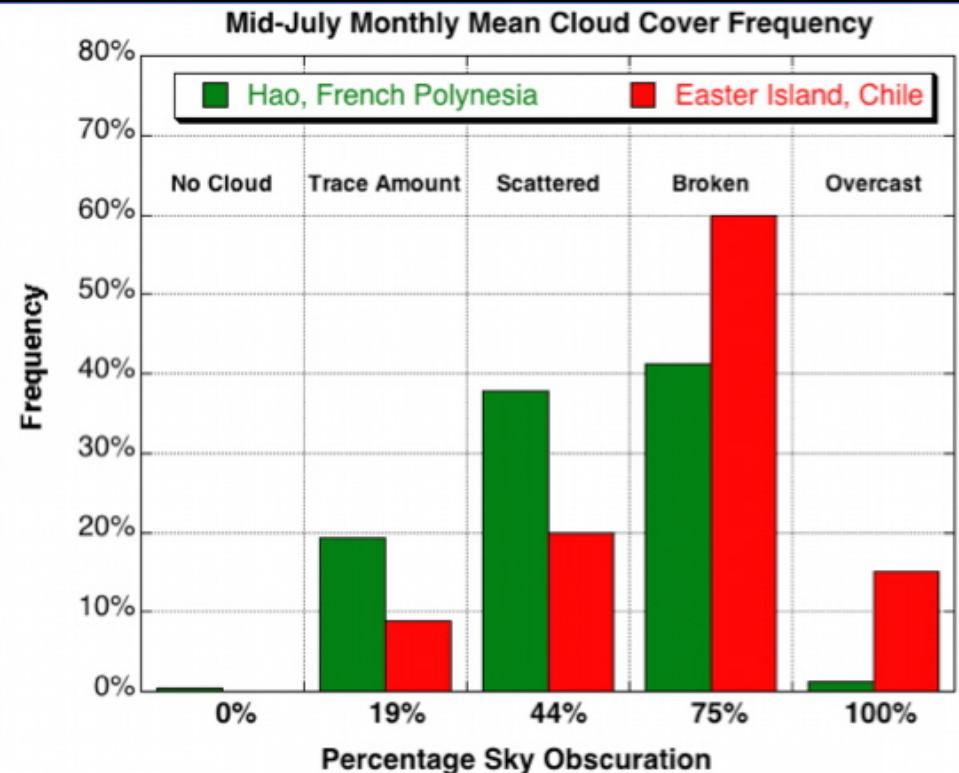
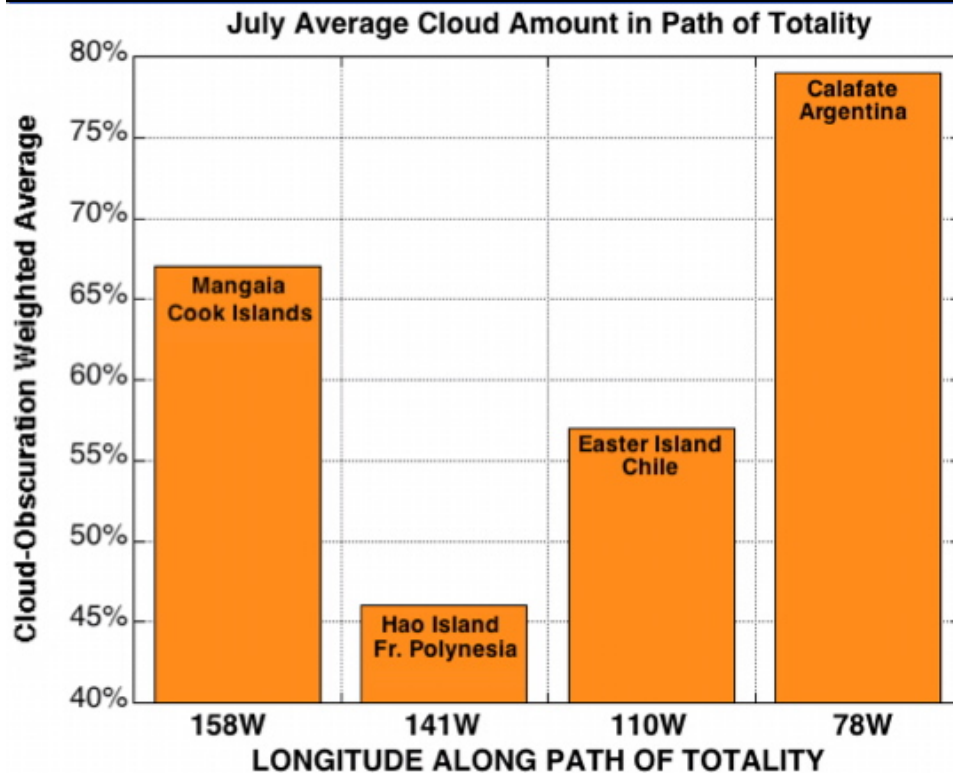
- Sparse umbral land-fall with little/no contingency mobility & logistical challenges

- **Cook Islands**
- **French Polynesian atolls**
- **Rapa Nui (Easter Island)**
- **Southern tip of South America at sunset (El Calefate)**



TSE 11 JULY 010

Land Choices Were Few Cloud Cover Probabilities Were High



TSE 11 July 2010

(again) USE AN AIRCRAFT!

DEPLOYMENT/RELOCATION FLEXIBILITY

To Find the BEST Spot in the Area of
Operations for Observing

CLOUD OBSCURATION AVOIDANCE

Clear Skies Virtually Assured

TOTALITY PROLONGATION

Aircraft Speed Extends the Duration of
Totality

SKY TRANSPARENCY

Significantly Improved — Lower Particulate
Scattering

SKY DARKNESS

Much Higher Coronal Contrast, Visibility
to Larger Distance

IMPROVED ASTRONOMICAL “SEEING”

“r_naught” Decreases with Increasing
Altitude

REDUCED ATMOSPHERIC TURBIDITY

Vorticity & Shear Decline in Power Above
Tropopause

**MORE PANCHROMATIC
TRANSMISSIVITY**

IR and UV “Windows” Open Up or are
Extended

**UNPARALLELED HORIZON REACH &
OBSERVATION VISTA**

Apparent Horizon ~ 300 km distant,
depressed 3.5° @ 40,000 ft.

ESTHETIC, ETHERIAL, EXPERIENCE

There is nothing quite like it...

TSE 11 July 2010

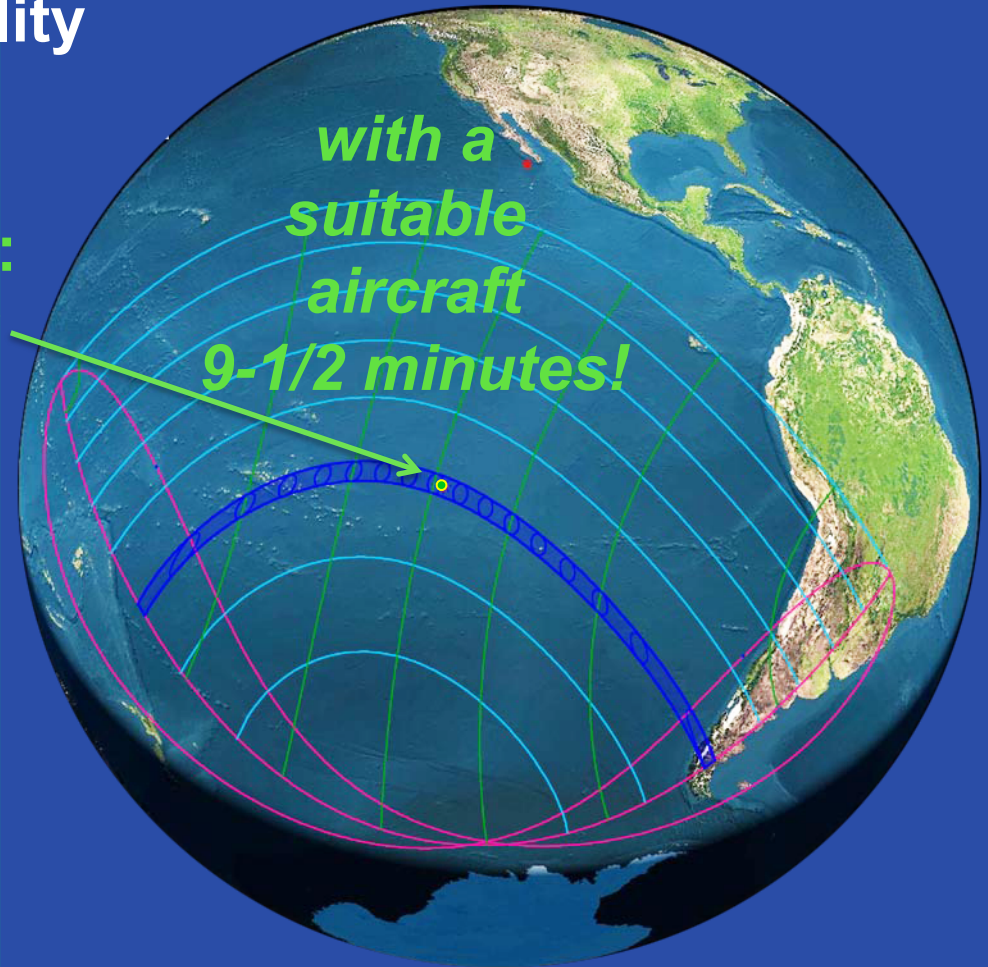
USE AN AIRCRAFT!

To Significantly Increase Totality
Duration Need to Fly Where
Umbra Velocity is Minimum

Location of Greatest Eclipse:
2157 km/hr

Logistical Considerations

- Aircraft Capabilities
(Range/Endurance)
- Aircraft Availability
(Willingness to Charter)
- Aerodrome Capabilities
(Must be Able to Support Flight Operations)
- Cost (“Wide-Body” A/C preclusive window-to-seat ratio)



EFLIGHT 2010 CHARTER REQUIREMENTS

NO suitable aircraft availability *in situ* or with ferry from:
Tahiti, Chile, Argentina, New Zealand, New Caledonia, Hawaii
or *almost* anywhere else! **EXCEPT...**

The SkyTraders Airbus A319-115 LR/CJ



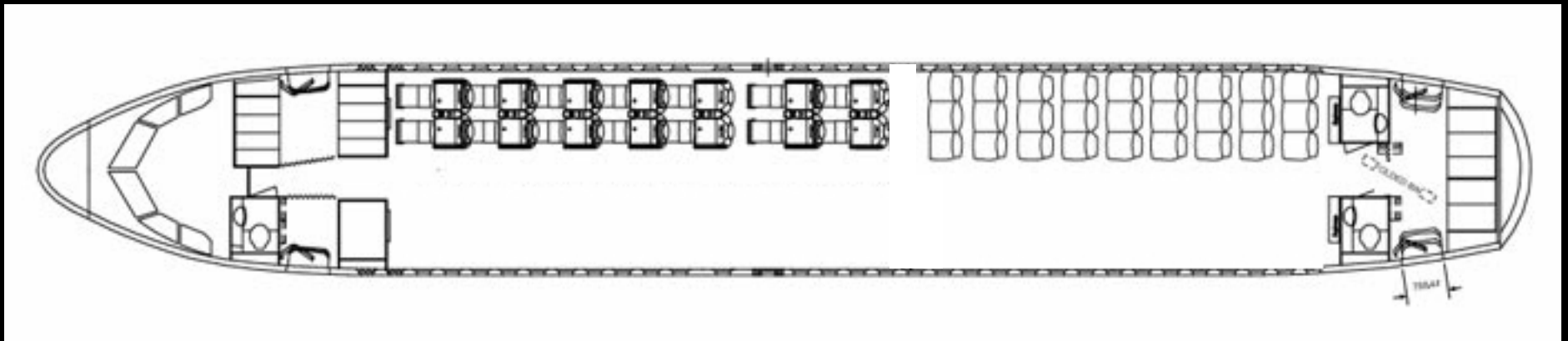
THE PERFECT Plane & Company for EFLIGHT 2010

- Met ALL Requirements (and More!)
- Normally used in support of Australian Antarctic Program (~ 9 months/year) with mid-July “off-season” – AVAILABILITY
- Owners, Operators, Crew DEEPLY Motivated and Engaged by the Technical Challenges -- not “just another charter!”

The SkyTraders Airbus A319-115 LR/CJ



THE PERFECT Plane & Company for EFLIGHT 2010

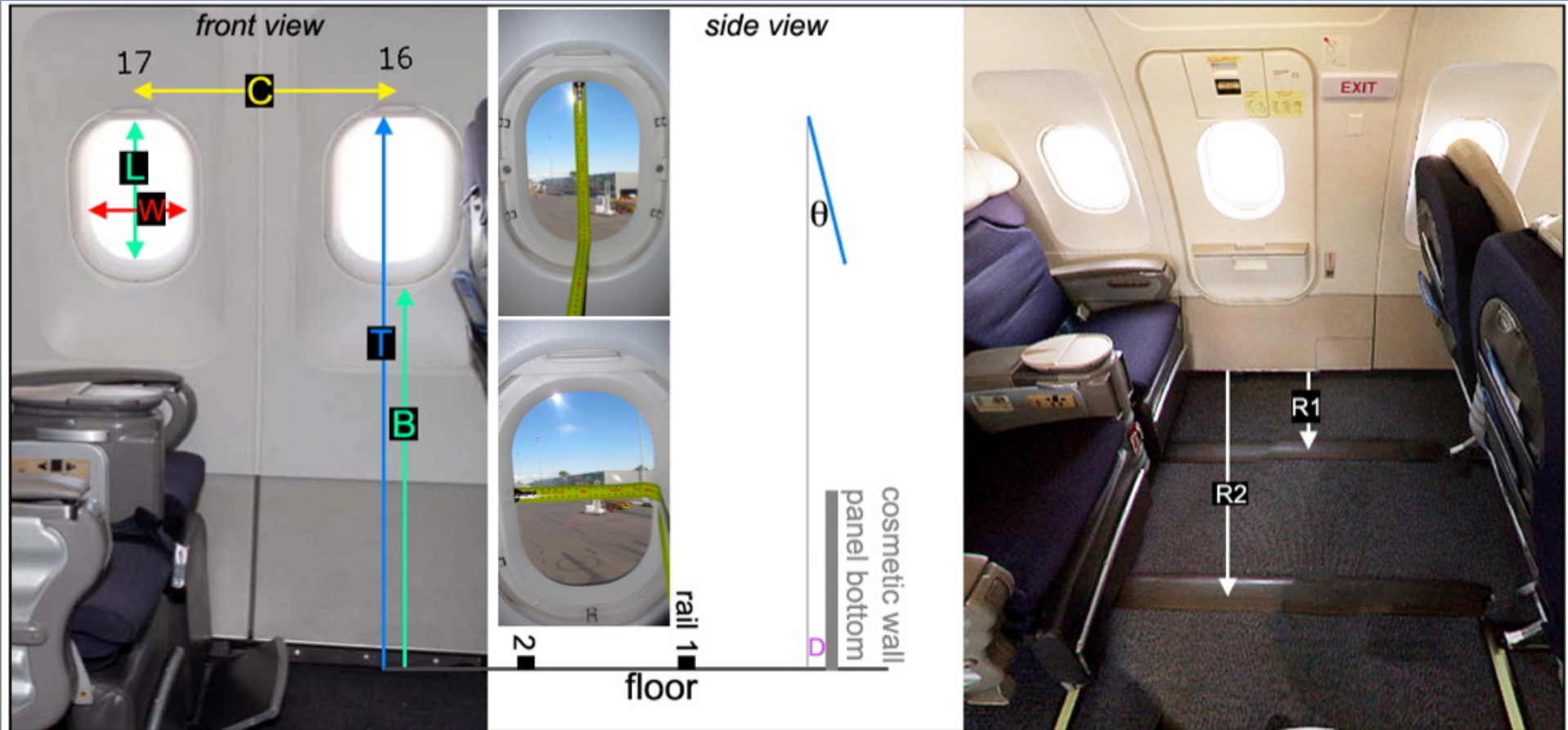


The Perfect Cabin (Seat to Sun-side Window) Configuration Plan

“No Seats? ... No Problem!”

The SkyTraders Airbus A319-115 LR/CJ

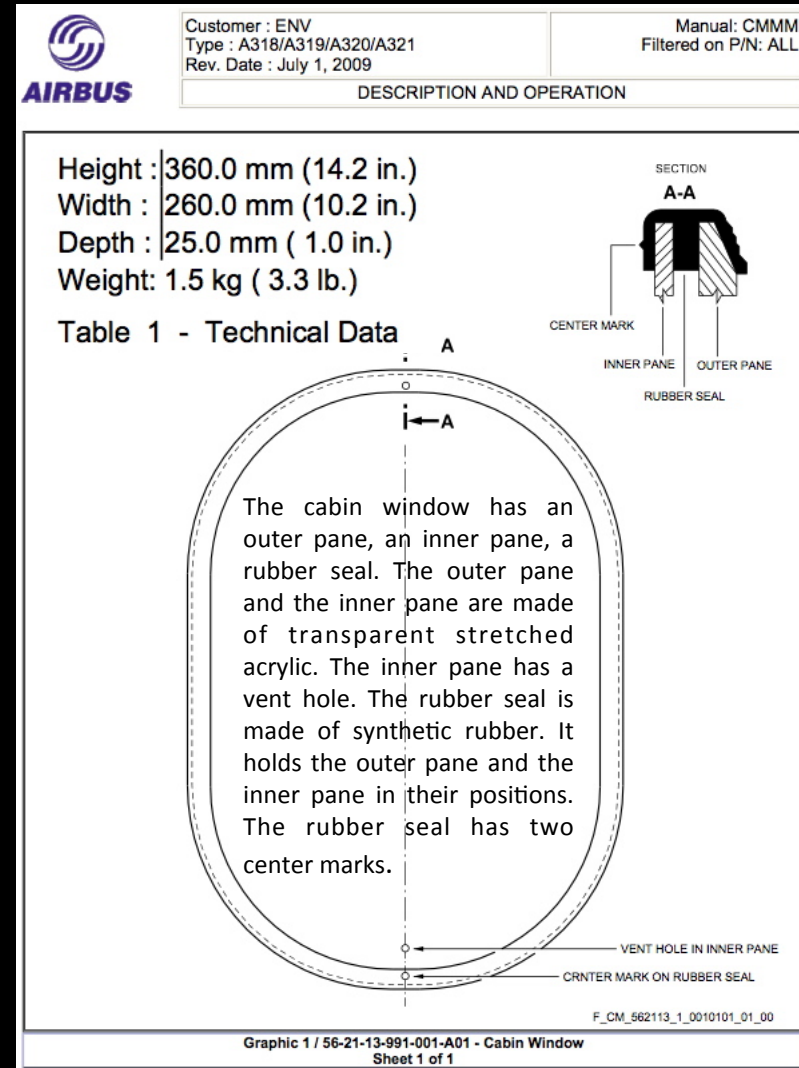
No "Guessing": Months ahead SkyTraders Provided Detailed Measures & Photos of the Window, Wall and Floor Viewing Areas



C = 53 cm	Inter-window centreline distance (most windows: a few have larger inter-window spacings; see below [a])
L = 30 cm	Window Length: glass area, trim removed
W = 21 cm	Window Width: glass area, trim removed
T = 114 cm	Top of window to floor vertical distance
B = 86 cm	Bottom of window (actual surface, not trim) to floor vertical distance
D = 0 cm	Top of window protrusion distance vertical to cabin floor edge [b]
$\theta = 14$ deg	Tilt angle (top inward) of window with respect to vertical [c]
R1 = 44 cm	Cabin wall to center of outboard seat rail
R2 = 96.5 cm	Cabin wall to center of inboard seat rail

The SkyTraders Airbus A319-115 LR/CJ

SkyTraders Removed (Annoying) Plexiglass Panels in Front of All Windows for the EFLIGHT and Provided Window “Templates” for Photographers for Planning Purposes

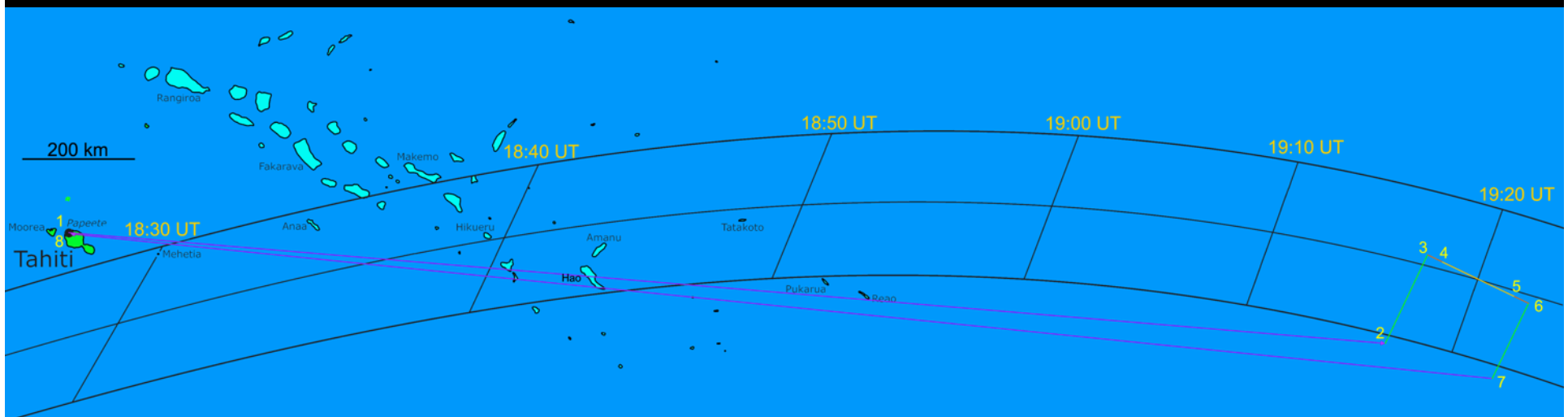


EFLIGHT 2010



BASELINE PLAN

***Centrally Intercept the Moon's Shadow @ 39,000 ft AMSL
From 2500 km East of Tahiti, French Polynesia at 19:20 UTC***



(Wave to our friends on Hao Island on the way out and back).

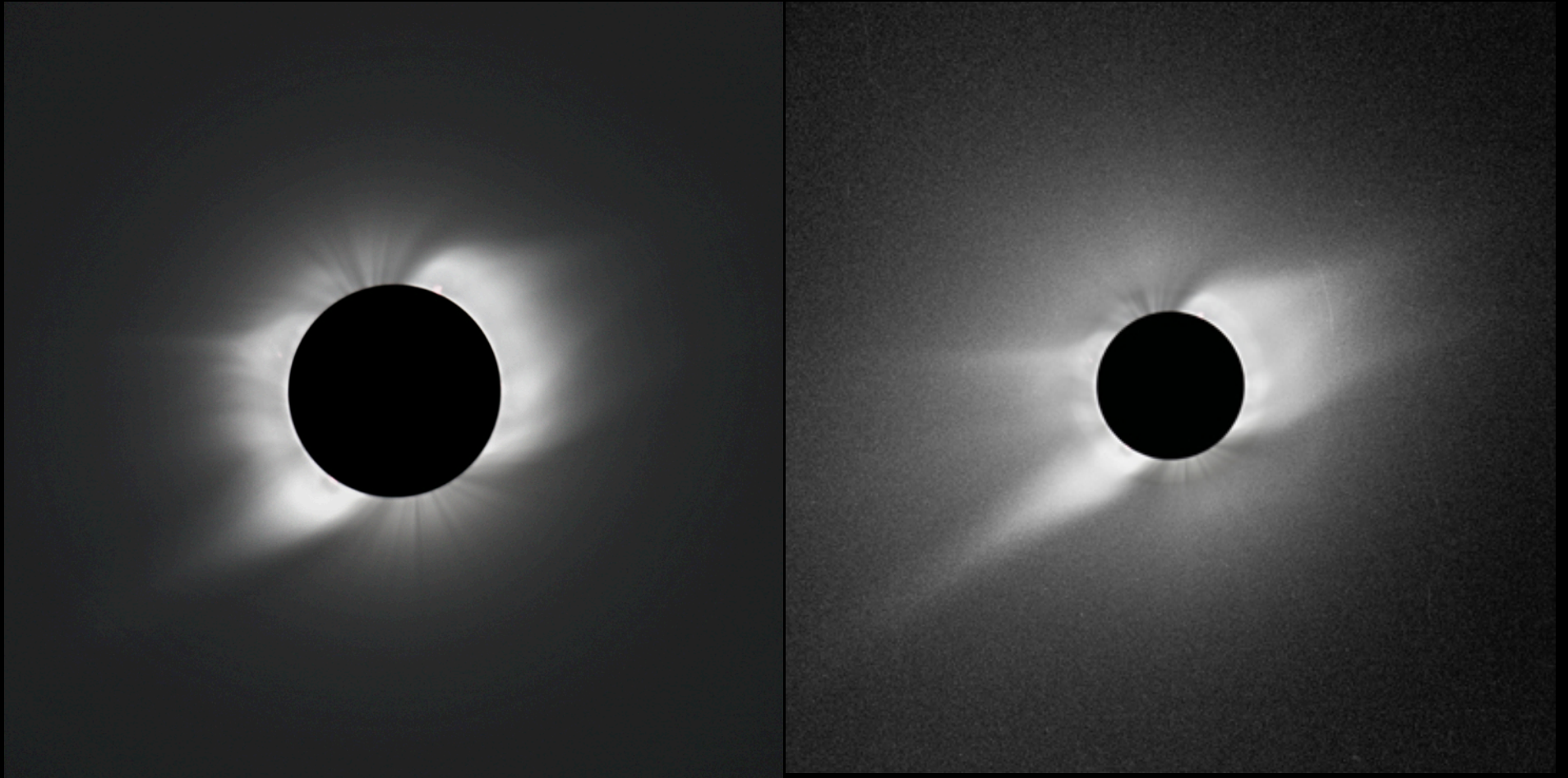
PLANNING PREDICATION ON MOST RECENT PRIOR FLIGHT – 2008

*The LONG View from On High (Horizon ~ 400 km)
EFLIGHT 2010 would optimize the “shadow viewing” opportunity*



PLANNING PREDICATION ON MOST RECENT PRIOR FLIGHT – 2008

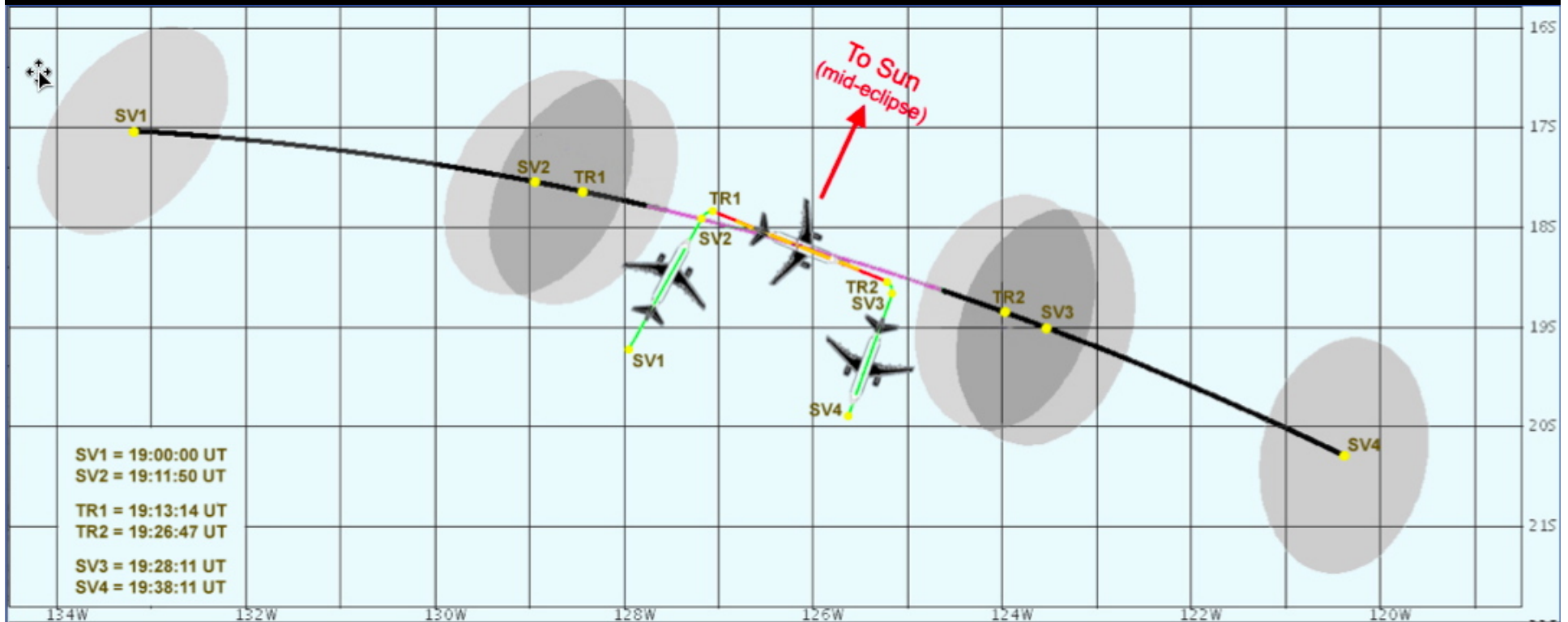
The DARKER View from On High (above $\frac{3}{4}$ of the Atmosphere)



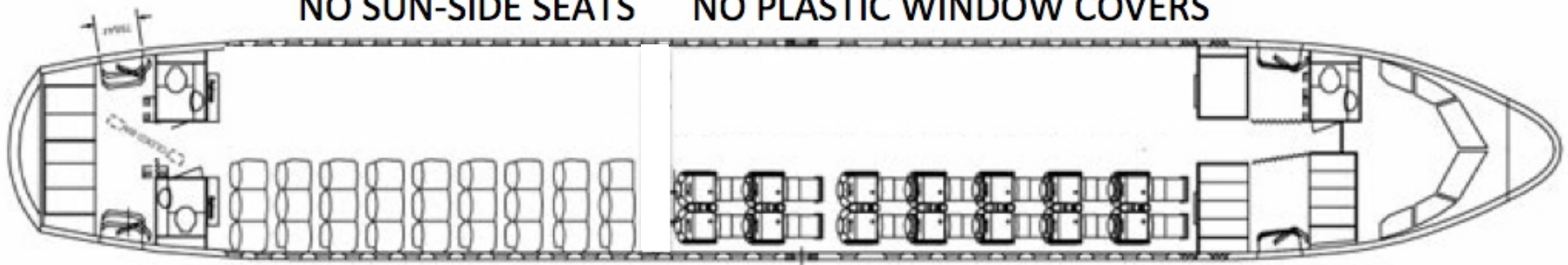
***EFLIGHT 2010 more deeply centered in a wider umbra
With the Sun higher in the sky (smaller LOS airmass)***

PLANNING PREDICATION ON MOST RECENT PRIOR FLIGHT – 2008

TSE 2010 PLAN for TOTALITY and SHADOW VIEWING



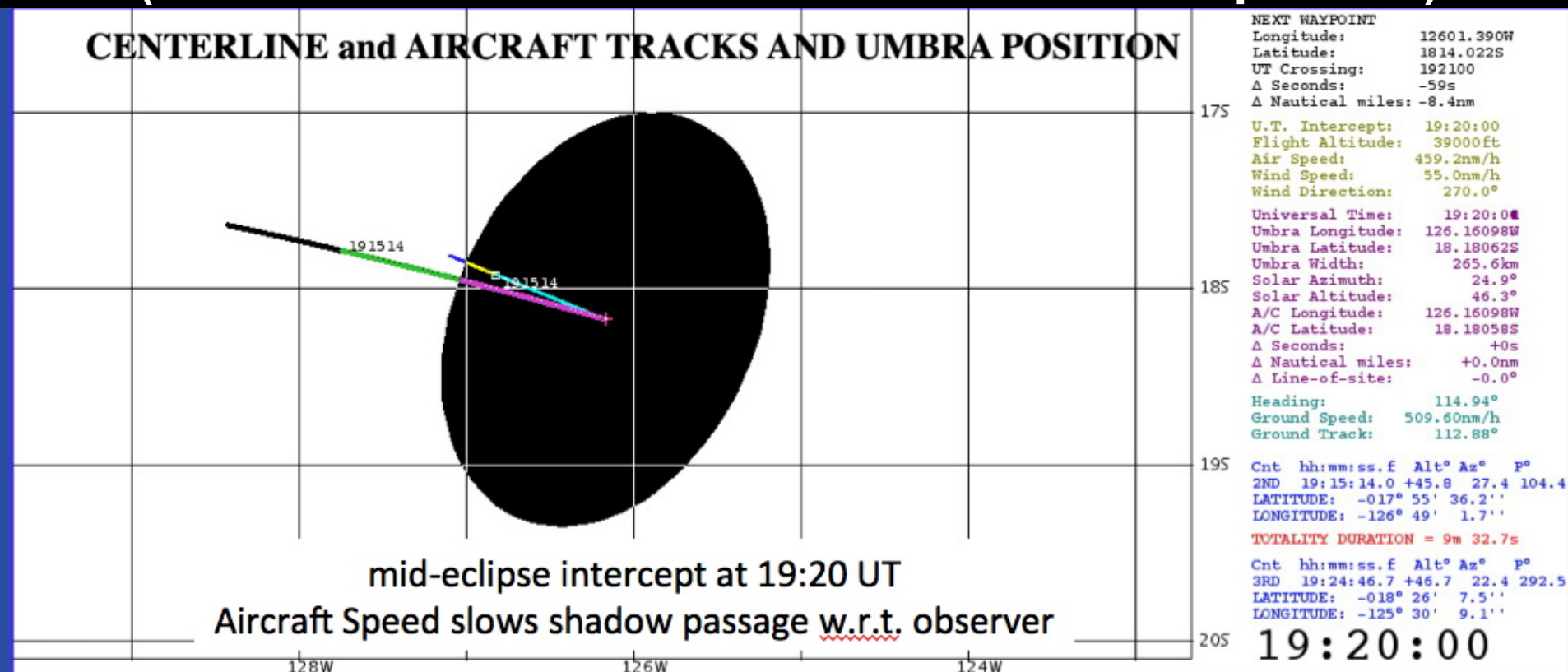
NO SUN-SIDE SEATS NO PLASTIC WINDOW COVERS



PLANNING PREDICATION ON MOST RECENT PRIOR FLIGHT – 2008

Planning for a Record Setting LOOOONG Totality

**The Eclipse Geometry and SkyTraders A319-115 LR/CJ
Would Allow ~ 9-1/2 Minutes (+/- ~ 10 s) of Totality
(with statistical historical winds aloft* & dispersion)**



* Median Historical Winds (FL 390, 20S/126W, mid-July): 270°/55 kts

AND THEN... IT ALL CAME TOGETHER

TAHITI, FRENCH POLYNESIA

08 JULY 2011 (TSE 2012 minus 3 Days)

“Contingency” Planning. Rick and Glenn invite the French Polynesian Minister of Tourism* (and 1st Lady Tsong) On-Board EFLIGHT 2010

* Assuring no bureaucratic delay of takeoff:
Minister Hamblin has final executive authority
over all operational aspects of F’AAA Airport



As the Tahitian Sunset Wanes on the Evening of 09 July 2010
our EFLIGHT aircraft (VH-VHD) and crew arrived on schedule in F.P.



As the Tahitian Sunset Wanes on the Evening of 09 July 2010
EFLIGHT 2010 UMBRAPHILES Gather for a Pre-Pre-Flight Briefing



10 July 2010 Morning VH-VHD Awaits Behind the F'AAA Airport Service Road Curve for our (EFLIGHT -1 Day) Pre-Flight Inspection



A group of approximately 12 people are posing for a photo on the deck of a boat. The group is diverse in age and attire, with some wearing lanyards. Two green arrows are drawn on the image: one points to a man in a plaid shirt on the left, and the other points to a man in a yellow shirt in the back row. The boat's interior features white cabinetry and a wooden railing. A sign on the left wall reads "Photo Workshop" and "Photo of the Boat". The background shows a glimpse of the water and other boats.

10 July 2010 Morning VH-VHD Airbus A319-115 LR/CJ
DELIVERED AS PROMISED and READY TO GO



10 July 2010 Morning VH-VHD

Up-Front: PIC and F/O Prepare for a Power-Up and Full Systems Check



AND...

To load the EFLIGHT -1 Day
Baseline Flight Plan
Into the Flight Management
Computer





10 July
2010

In
The
“Back”

Eclipse
Viewing
Cabin
Check



11 July 2010 Midnight



hors taxe
free shop
free shops



Départ
Portes 30 à 61

Departure
Gates 30 to 61



04:01



CHARIOTS
INTERDITS



NO
TROLLEYS



ACCÈS RÉGLEMENTÉ



ACCÈS RÉGLEMENTÉ



ACCÈS RÉGLEMENTÉ



ACCÈS RÉGLEMENTÉ

11 JULY 2010
Flight Crew Pre-Flight – All Systems Go!



EXPECTED DURATION: 9 m 23 s



Flight Duration:	06h39m28s	PAPAE > PATIA	35.0	/240.0
U.T. Intercept:	19:20:00	PATIA > SVITS	50.0	/260.0
Flight Altitude:	39000ft	SV1 > SV2	55.0	/270.0
Air Speed:	447.4nm/h	TR1 > TR2	55.0	/270.0
Wind Speed:	55.0nm/h	SV3 > SV4	55.0	/270.0
Wind Direction:	270.0°	CR4 > CR5	40.0	/250.0
DURATION = 9m 23.0s		CR5 > CR6	40.0	/225.0

WPTID	U.T. HMS	LONG DM.f	LAT DM.f	Track	LegNM	LegDuratn	GSPNM
=====	=====	=====	=====	=====	=====	=====	=====
AP0	16:20:26	14936.68W	1732.40S	101.0			
					268.0	00h38m10s	421.3
PAPAE	16:58:36	14500.00W	1820.00S	98.8			
					287.5	00h36m16s	475.7
PEBRO	17:34:51	14000.00W	1900.00S	93.8			
					284.3	00h35m44s	477.4
PATIA	18:10:35	13500.00W	1915.00S	91.8			
					283.7	00h34m16s	496.7
PATUI	18:44:52	13000.00W	1920.00S	92.5			
					102.8	00h12m26s	496.4
SUITS	18:57:17	12811.29W	1923.87S	*CRT*			
					20.6	00h02m43s	456.6
SV1	19:00:00	12753.17W	1913.98S	20.1			
					84.3	00h10m45s	470.6
SV2	19:10:45	12722.73W	1754.92S	*CRT*			
					17.1	00h02m15s	456.6
TR1	19:13:00	12705.65W	1748.98S	112.3			
					37.3	00h04m30s	497.8
ITI	19:17:30	12629.38W	1803.04S	112.1			
					20.7	00h02m30s	497.8
MID	19:20:00	12609.18W	1810.80S	112.1			
					20.7	00h02m30s	497.5
ITE	19:22:30	12548.99W	1818.57S	112.3			
					37.2	00h04m30s	496.6
TR3	19:27:00	12512.71W	1832.64S	*CRT*			
					17.1	00h02m15s	456.6
SV3	19:29:15	12506.44W	1846.84S	202.0			
					69.7	00h09m45s	429.1
SV4	19:39:00	12534.22W	1951.32S	*CRT*			
					20.9	00h02m45s	456.6
CR4	19:41:45	12550.16W	2000.97S	272.3			
					605.0	01h28m23s	410.7
CR5	21:10:08	13629.89W	1917.58S	275.9			
					605.0	01h25m45s	423.3
CR6	22:35:54	14701.68W	1757.56S	279.3			
					150.0	00h24m00s	375.0
AP0	22:59:54	14936.68W	1732.40S				

```

CRT SUITS-SV1 VERTEX: 12757.13W 1924.20S
CRT SV1-TR1 CENTER: 12709.98W 1759.05S
CRT TR2-SV3 CENTER: 12517.07W 1842.70S
SUITS Displaced by 2.49nm/270.05d from 12808.66W 1923.88S
SV2 Displaced by 2.06nm/270.06d from 12720.56W 1754.92S

```

	HH:MM:SS	LONGITUDE	LATITUDE	dTIME	dDIST	LOS	AZIM	ALT
C2	19:15:18	12647.125W	1756.182S	-282s	-39.0nm	+1.7	26.5	46.0
C3	19:24:41	12531.375W	1825.381S	+281s	+38.9nm	-1.2	23.4	46.5

Aircraft Nose +2.00 deg. WEST of Solar Azimuth at SV2
Aircraft Heading at SV1: 16.11 deg.
Aircraft Heading at SV2: 16.25 deg.

KB: Non-APL

11 JULY 2010 All Aboard!







Umbraphiles from all walks of life and all over the globe...





11 JULY 2010 EFLIGHT Dawn on Eclipse Day Morning



11 JULY 2010 EFLIGHT Sunrise on Eclipse Day Morning

18:57 UTC: AWAITING THE SHADOW!



19:09:40 UTC: THE SHADOW COMETH!

Cloud tops earlier seen at 19:02 UT extending all the way to the 400 km distant horizon disappeared as an umbral veil of gray darkness drew cover over the ocean below and sky above with chromospheric light aglow above the 3.5° depressed astronomical horizon.





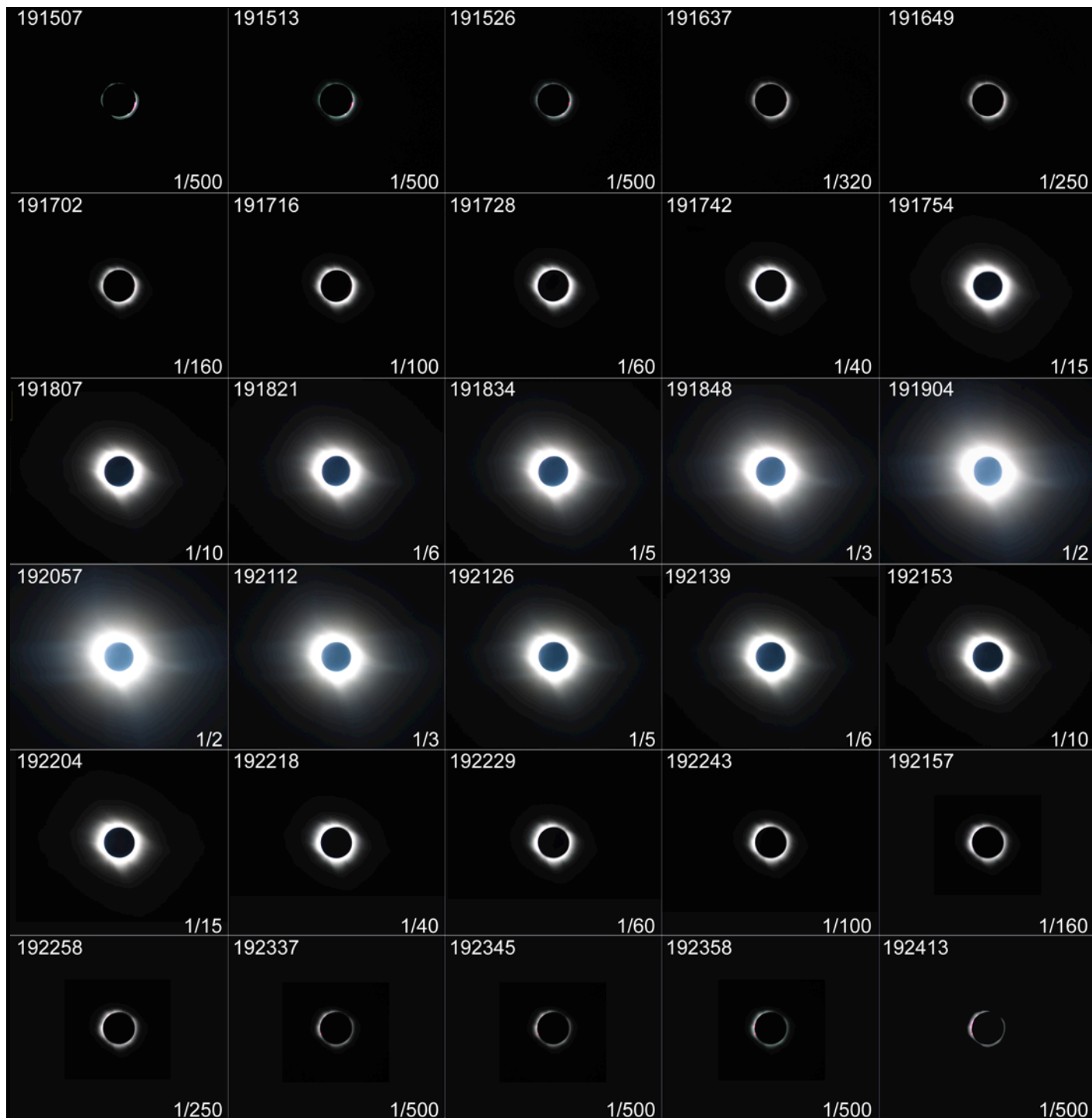
Immersed in the Umbra



www.MrEclipse.com

©2010 F. Espenak

Photo: Fred Espenak



IMAGING TOTALITY

Camera¹: NIKON DX3 DSLR

Lens²: NIKON 80-400 VR

Provided by: J. Moskowitz¹

J. Pasachoff²

Configuration: f/5.6, ISO 200

Exposures: 1/500 to 1/2 sec

Ramp: log-normal up/down

Control: SEM (Jubier)

Frames: Thirty of 212

Time span: 9.5 minutes





mid-Corona < 3 Rsun

Camera¹: NIKON DX3 DSLR

Lens²: NIKON 80-400 VR

Provided by: J. Moskowitz¹

J. Pasachoff²

Configuration: f/5.6, ISO 200

Exposures: 1/500 to 1/2 sec

Ramp: log-normal up/down

Control: SEM (Jubier)

Composite: 6 of 212 Frames

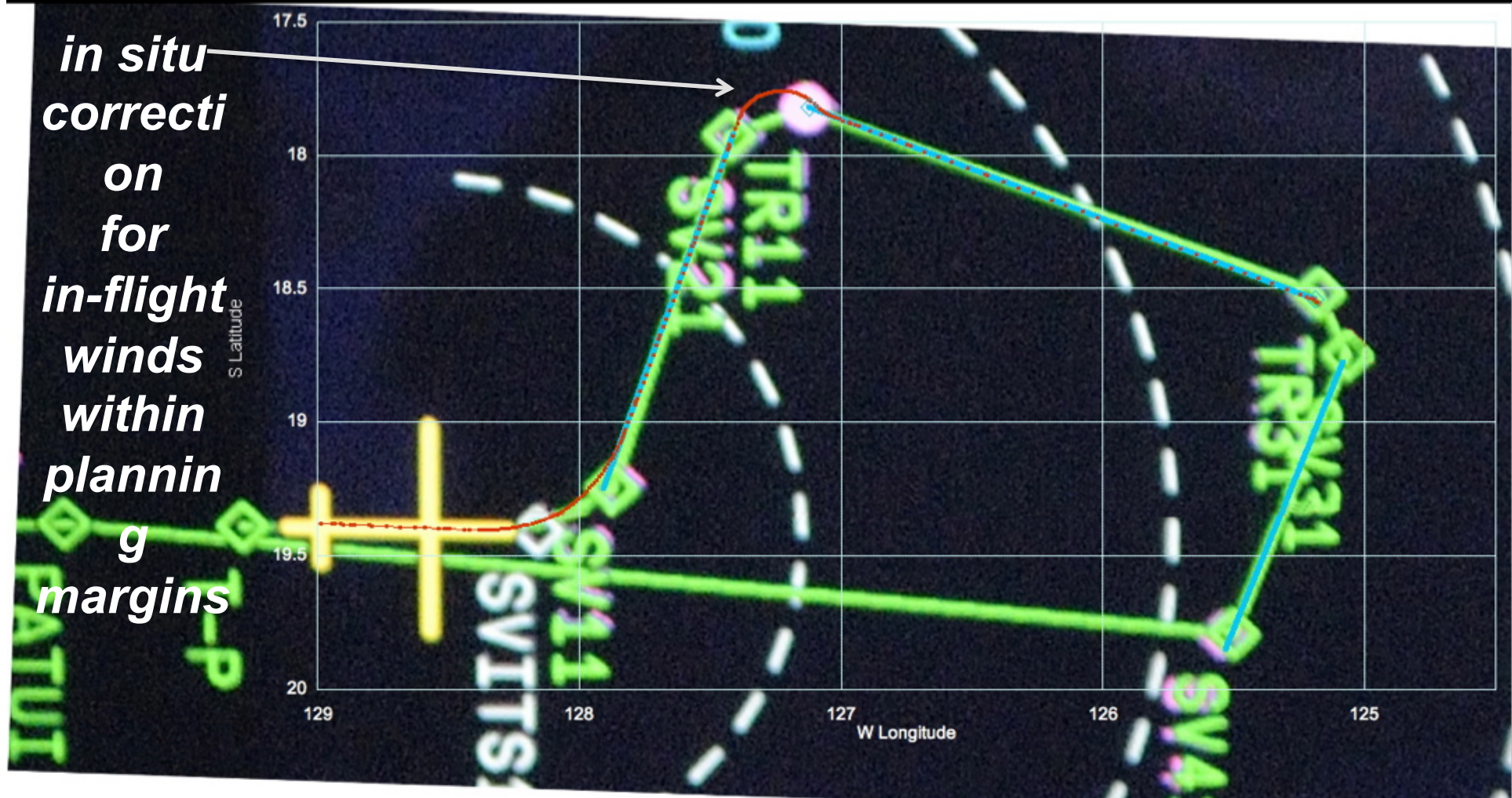
Time span: 9.5 minutes



OUTER-CORONA < 8 R_{sun}. Composite 32 of 212 frames



RIGHT ON THE TIME-CORRELATED MARKS EFLIGHT PLANNED, FMS EXECUTED, GPS TRACKED



◆ KEY PRE-PLANNED NAVIGATION TIME-CORRELATED WAYPOINTS
..... REAL-TIME GPS TRACKING OVERPLOTED ON FMS DISPLAY

The 11 July 2010 Total Solar Eclipse

A Remarkable, Record-Setting, Adventure @ 39,000 ft



9m 23s – One for the Record Books



GLENN SCHNEIDER, astrophysicien de l'observatoire de l'université d'Arizona

Chercheur d'éclipses

And Then, It was *HISTORY!*



À sa descente de l'avion affrété pour des scientifiques américains, Glenn Schneider (à droite) raconte : "C'était magnifique" et pourtant, il en est à sa 29^e éclipse.

Comment s'est déroulé le vol ?

"C'était magnifique, c'était spectaculaire. C'est une des choses les plus merveilleuses que l'on peut voir. L'éclipse était visible dans un ciel incroyablement sombre, si haute au-dessus de nos têtes et la couronne du soleil était splendide, l'ombre de la lune était composée de superbes couleurs que nous pouvions voir sur des centaines de

kilomètres. C'était juste une des choses les plus incroyables que nous avons jamais vu. C'était magnifique."

Ce n'était pas votre première éclipse...

"Non, c'est ma 29^e éclipse totale de soleil et chacune d'entre elles est encore plus belle que la précédente. Celle-ci a vraiment été spectacu-

laire."

Qu'elle était la particularité de cette éclipse ?

"Être aussi haut dans le ciel, à 12 000 mètres d'altitude, et la vitesse de l'avion, la vitesse de l'ombre de la lune que l'avion essayait de rattraper et il a réussi à ralentir, nous a permis de vivre une éclipse plus longue. Nous avons eu 9 minutes et demie d'éclipse totale

et nous sommes restés très longtemps dans l'ombre de la lune. C'était juste un panorama magnifique."

D'un point de vue scientifique, avez-vous appris de nouvelles choses, recueilli des données ?

"Sur ce voyage, nous n'avons pas fait de travaux de recherche. Nous l'avons fait dans le passé mais ce voyage-là avait pour objectif de donner à voir et à vivre une éclipse totale du soleil."

Avez-vous pris des photos, avez-vous filmé l'éclipse ?

"Nous avons pris des centaines de photos, de vidéos. Je les mettrai sur mon site Internet de l'université d'Arizona. Cela me prendra quelques semaines pour travailler et trier les images mais ensuite, tout le monde pourra les consulter. Mais une photo ne saisit pas tout, il faut voir de ses propres yeux."

Quand et où sera la prochaine éclipse ?

"Elle se produira en novembre 2012 dans le nord de l'Australie, dans le Queensland et je pense que quasiment toutes les personnes qui étaient sur ce vol seront également de ce voyage."

Propos recueillis par CV

Longest view of a total solar eclipse from onboard a commercial aircraft



Share        

Who

**ERIC BROWN, GLENN SCHNEIDER,
SKYTRADERS AUSTRALIA**

What

9/23 MINUTE(S):SECOND(S)

Where

NOT APPLICABLE ()

When

11 JULY 2010

On 11 July 2010 EFLIGHT-2010, a chartered Airbus A319-115 LR/ACJ, remained within the umbral shadow of a total solar eclipse for 9 minutes and 23 seconds. The flight was organised by Eric Brown and astronomer Glenn Schneider (both USA) and executed by Skytraders Australia. It carried 36 passengers and 7 crew members to view totality over the Pacific Ocean some 1,500 miles east of Tahiti, at an altitude of 39,000 feet.