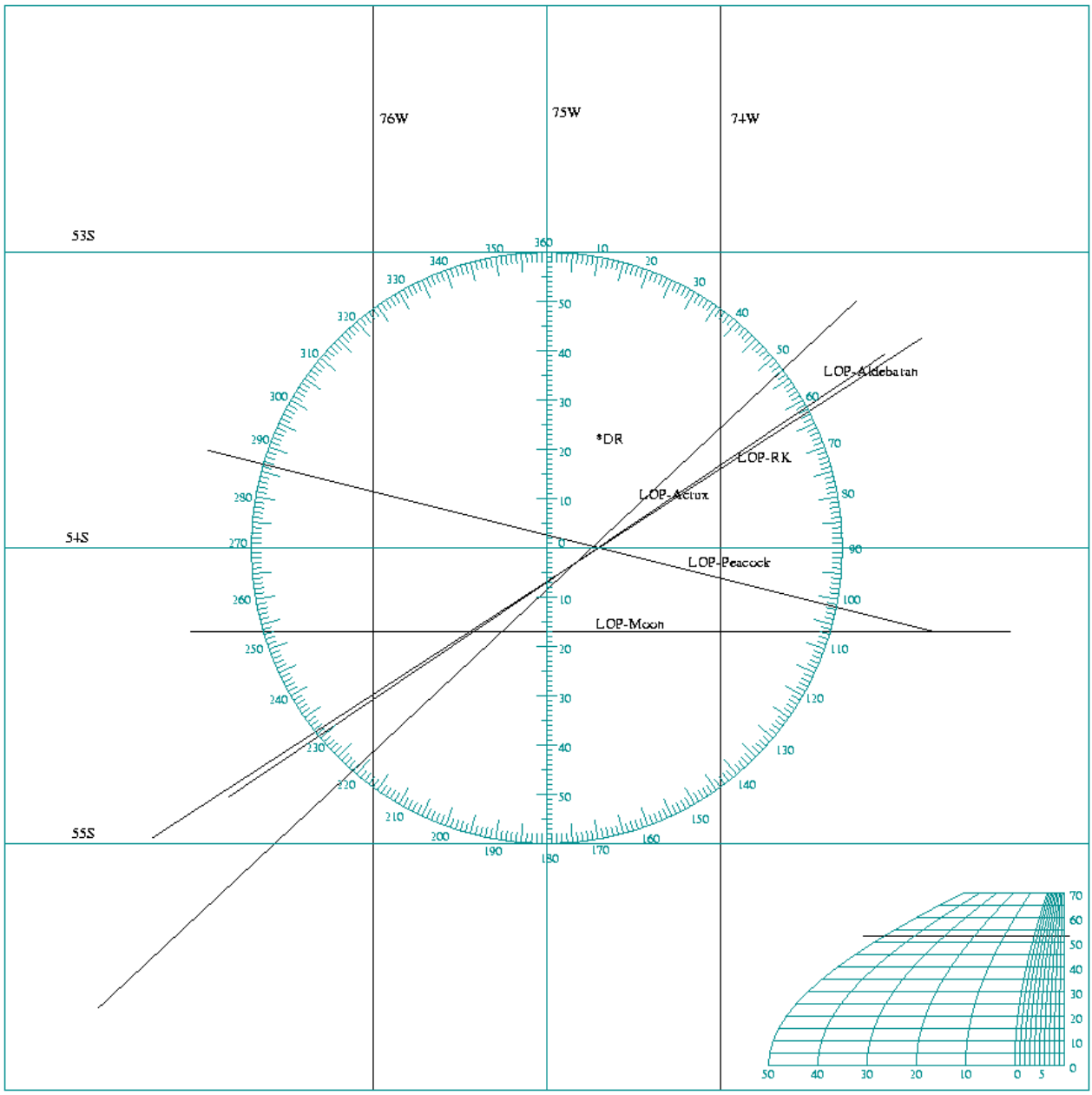
NAVIGATIONAL ALGORITHMS
Celestial Navigation with a Calculator



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Sight Reduction with a calculator

Estimated Position	B =	L =	UT1 =	date:
Course & Speed	R =	V =		

Observation	UT1				
Celestial body					

Observed Altitude Ho

Sextant Altitude:	**Hs**				
Instrumental Error:	EI				
DIP					
Height of eye above sea level: h [m]					
D = 0.0293 √h [º]					
Apparent Altitude	**H** = Hs + EI - D				
Refraction					
if(H > 15º)	R0 = 0.0162 / TAN(H)				
P [mb]					
T [ºC]					
f = 0.28 P/ (T+ 273)					
R = f R0					
Parallax – *Sun, Moon, Venus, Mars*					
HP *(Sun HP = 0.0024º)*					
Moon OB = 0.0032(sin 2B cos z sin H - $\sin^2$B cos H)					
PA = HP COS H + OB					
Semidiameter					
• *Sun SD ≈ 16'*					
• *Moon SD ≈ 0.2724° HP*					
Ho = H - R + PA ± SD					

Identification of the celestial body

Z				
Dec = ASIN[Sin B Sin Ho + Cos B Cos Ho Cos Z]				
LHA = ATAN[(Tan Ho Cos B - Sin B Cos Z)/ Sin Z]				
GHA = LHA – L				

Geographical Position – Substellar Point

	Dec				
☆	GHA_{Aries}				
☆	SHA				
$GHA_{☆}$ = GHA_{Aries} + SHA	GHA				

Line of Position intercept – Marcq St Hilaire

LHA = GHA+L				
Hc = ASIN[sin B sin Dec + cos B cos Dec cos LHA]				
Z = ACOS[(sin Dec - sin Hc sin B)/(cos Hc cos B)]				
if(LHA = W) Z=360-Z				
p = Ho - Hc				