

FS ACADEMY

VOYAGER

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***MANUAL VERSION
11 MARCH 2022***



Take in our breath-taking world by embarking on a series of 7 Bush Trips across some of the most iconic locations. Cruise past the skyscrapers of NYC, gaze deep into the Grand Canyon and try not to get wet as you circle Niagara Falls.

Choose a route from the CUSTOM CONTENT menu and follow the in-game navlog, setting your weather with the in-game toolbar.



➤ **VOYAGER 01. THE ALPS**
Embark upon a journey through the Austrian, Swiss and French Alps.



➤ **VOYAGER 02. CANARIES**
The volcanic Canary Islands are a hugely popular winter sun destination.



➤ **VOYAGER 03. FLORIDA KEYS**
Pass alongside the impressive Cape Canaveral and track the Florida coast.



➤ **VOYAGER 04. GOLD COAST**
The Australian Gold Coast is a major destination for people the world over.



➤ **VOYAGER 05. NYC TO TORONTO**
Leave the bustling New York City up the Hudson to embark on a cross country adventure.



➤ **VOYAGER 06. NEW ZEALAND**
Tour the beautiful North Island of New Zealand.



➤ **VOYAGER 07. LA TO BRYCE CANYON**
Cross the stunning landscapes spanning Nevada, Arizona and Utah on this memorable journey out of LA.



Please visit our support page if you encounter difficulties

fsacademy.co.uk/support-voyager

RESTARTING A TRIP

PC ONLY: To delete your progress and start a trip again, navigate to this location and delete the save files for that trip. Be careful to only delete the saves for the trips you intend to restart. This folder may need to be unhidden in Windows.

**C:\Users\NAME\AppData\Local\Packages\Microsoft.FlightSimulator_LETTERS
+NUMBERS\LocalState\MISSIONS\ACTIVITIES**

Steam Users:

C:\Users\NAME\AppData\Roaming\Microsoft Flight Simulator\MISSIONS\ACTIVITIES

NAVIGATION

Use the in-game toolbar to display the Nav Log and VFR Map. If a desired panel is absent, enable using the menu revealed by clicking the cog icon.

Accurately fly each heading for the given times and you will arrive at each waypoint, which have accompanying descriptions in the Nav Log.

Visually acquiring waypoints is your primary method of navigation. Avionics may show estimated route lines, distances and times, but this is not always available nor accurate and should be secondary guidance only.

Come to a full stop on the runway to end each leg.



ROUTE GUIDES

The in-game Nav Logs are repeated here for your convenience.

ETE times in these route guides are estimated assuming a generic cruise speed, which is representative of most light GA aircraft. Dark Grey represents a stopping off airport.

THE ALPS



Route	LOWI - LFMQ
Distance	567NM
Time	4H45
Legs	7

Embark upon a journey through the Austrian, Swiss and French Alps. Keep an eye out for glaciers as you cruise through deep valleys between the magnificent mountain peaks. Tour Zurich and Geneva before heading into France towards Paul Ricard race circuit.



TO WAYPOINT	HDG	DIST	ETE	DESCRIPTION
TELFS	279	11.4	11:05	We commence our journey through the Alps by heading to Telfs, the town around the right turn in the valley, following the river Inn, where Innsbruck gets its name.
OTZAL BAHNHOF	243	10.6	5:02	Continue along the Inn to the tunnel entrance and quarry site
SCHONWIES	252	6.6	3:04	Take a right through the next valley, still along the Inn, spotting the small bridge
LANDECK	228	5.7	2:42	See where the railway and river unite and the river bends at this town
BACH	270	6.4	2:58	Follow the valley to the right, this town may be difficult to spot in the mountains shadow
ST ANTON	255	5.9	2:43	The elongated town is found along the valley, with long building to the southern side
VALLEY TURN	238	2.0	0:56	Tracking the mountainside road, take a sharp right up the hill and into the next valley. The road is your most reliable guide.
STUBEN	296	3.0	1:25	Continue along the road as it sweeps left through the valley, to Stuben, with its sharply winding road and red roof
DALAAS	258	6.7	3:06	Parallel the road and railway to where the railway deviates to the right temporarily, featuring the swimming pool
BLUDENZ	282	7.7	3:36	Take a right at the end of the valley and find the larger town and railway depot at Bludenz
FELDKIRCH	301	10.5	5:05	The river continues through to a narrow valley, looking for this hillside with town either side.
LSZR - ALTENRHEIN	350	14.1	7:00	
KONSTANZ	302	19.0	8:50	Head up the lakeside to the narrow point where you see the town on Konstanz. The right-hand side of the lake is Germany.
UNTERSEE	264	12.1	5:28	Travelling West over the water until it narrows to a river at Untersee
SCHAFFHAUSEN	281	10.2	4:39	The famous watchmaking town is along the river and found as a larger town with prominent railway sidings and river rapids.
LSZH - ZURICH	191	14.4	7:00	
ZURICH CITY	179	5.8	2:50	Leave Zurich Airport Southbound to meet the lake at the city centre
LAKE ZURICH	148	8.2	4:08	Continue South to around halfway the length of the lake, where a small hill protrudes outwards
ZUG	228	7.1	3:17	The lakeside town of Zug is located at the very North East tip of the Lake
INDUSTRIAL COMPLEX	214	4.6	2:06	Fly over the lake to West of the narrow point at the industrial complex
ARTH	132	4.2	2:04	Proceed to the Southern tip of the Lake Zugersee
SCHWYZ	111	5.0	2:31	Small town found just beyond the small lake and beside the ridge line
LAKE LUCERNE	186	8.0	3:50	Track to the southern edge of the lake
STERN POST	160	7.6	3:39	Into the valley you see the initially straight canal turns to river, until a land works site
ANDERMATT	200	9.2	4:32	Further into the valley tracking the river, the fork appears at the town, we're taking the right fork. Andermatt has a triangle shape of road around it.
MOUNTAIN PASS	236	1.2	0:34	Notice how the road continues uphill into the lower saddle shaped gap between the highest ground.
OBERGOMS	176	1.4	0:41	Turning through the valley a little further you find it widen where the river has a right-angled king and land works at the Eastern side
ULRICHEN	227	2.8	1:25	Pass overhead the now closed Ulrichen airfield, continuing along the valley

BRIG	228	17.0	8:20	Follow a long stretch of valley, past another closed airfield and onwards down this relatively straight canyon to Brig, the first town find
TURTMANN	264	11.7	5:42	The parallel river and railway will pass two airfields. The second is Turtmann
SIERRE	261	7.2	3:35	Pass overhead Sierre, the larger town along the valley
LSGS - SION	244	9.9	4:57	
MARTIGNY	237	12.2	5:57	Proceed down the valley until it takes an almost unnatural right hand 90 degree turn at the town of Martigny
LE BOUVERET	331	19.2	9:03	Track the river all the way to its mouth at Lac Lemman
LAUSANNE	304	11.6	5:38	The North shore of the lake is distinguished by Lausanne. Locate the harbour at the southern tip.
ROLLE	257	12.1	5:46	Carry on along the Lake to this smaller town
COLOGNY GOLF	203	15.5	7:36	Continue along Lac Lemman almost to its end, stopping at the golf course before heading East towards our next stopover
LFLI - ANNEMASSE	121	3.6	1:45	
LANCY STADIUM	261	5.9	2:49	To avoid Geneva CTZ, we head West to the stadium at Lancy
HILLSIDE	213	11.6	5:41	Find the single hill at the southern end of the range
LFLP - MEYTHET	132	7.7	3:47	With Lake d'Annecy beyond, find Annecy Meythe airfield with the town in between the lake and airstrip, passing through the next narrow hillside gap.
AIX-LES-BAINS	210	15.7	7:38	At the eastern shore of the lake, track inbound to this large town at the southern end of the hill range
JUNCTION	146	10.9	5:18	Where the highway approaches the river, you will find a triangle junction
LFLG – LE VERSOUD	204	17.6	8:26	
SAINT-GEORGES	209	12.1	5:55	South of Grenoble lies Saint-George where the first of a series of small lakes begin
LAC DE MONTEYNARD	184	10.4	5:06	Heading south along the Lake, reach its far end where it forks. We will follow the left fork.
LE DRAC	085	5.0	2:49	Proceeding East to the next narrow lake and source of Le Drac
LE MOTTY	124	9.2	5:46	After narrowing to a river, follow the left leg of this V shaped lake to Le Motty, where the riverbanks can be seen in a lighter colour.
PASCAL QUARRY	140	10.9	5:20	Track the riverbank until the quarry, at the centre of a + shape of trees
GAP	212	6.6	3:20	The town of Gap is situated to the south, aim specifically for the roundabout to the west of the town centre
LFNA – GAP TALLARD	186	6.2	3:09	
LA SAULCE DAM	200	2.2	1:05	Commence the final leg of our journey by threading into the next valley starting with the hydro-electric dam
SAB QUARRY	225	6.2	3:07	This large SAB quarry is bright and easy to spot whilst tracking the canal and roadway
LFMX – ST AUBAN	169	17.8	8:55	Look for this grass strip, passing the narrow hillside gap around halfway, with the town to the north and industrial zone adjacent
VINON	207	23.6	11:52	Continue along the canal way past the airfield to the man-made lake
PLANTAIN	242	6.9	3:29	Exiting the valley fly to the lighter blue lakes, aiming for the buildings on the small island
AIX-EN-PROVENCE	221	9.7	4:56	The large town lies to the South West, target the older red roofed section for your turn point
SOLAR FARM	140	5.5	2:41	Keeping the bright red landscape and military airfield on your right, locate the solar panels arranged into a circle

VALDONE	160	4.1	2:03	Pick out this lighter coloured section of industrial buildings to find your way across the built-up areas
JUNCTION	136	3.7	1:50	A highway junction is situated at our next turning point, we will follow the highway to the right
AUBAGNE	193	4.0	1:58	The large industrial zone is found at the base of the dark green hillside, near the major A52 highway
VALLEY	114	2.9	1:24	To set us up towards Circuit Paul Ricard and our final destination, point toward the valley, with clearing just beyond
LFMQ – LE CASTELLET	099	5.6	5:28	



THE CANARY ISLANDS



Route	GCRR - GCHI
Distance	500NM
Time	3H35
Legs	6

The volcanic Canary Islands are a hugely popular winter sun destination. Take a tour around Lanzarote with its Martian landscape before making several crossings between these stunning islands. Circle the impressive Mt Teide of Tenerife and discover these islands like never before.



TO WAYPOINT	HDG	DIST	ETE	DESCRIPTION
ARRECIFE	087	3.2	3:12	After takeoff, head NE to Arrecife town.
CHARCO DEL PALO	036	9.2	11:39	Follow the island coast past the popular holiday resorts of Costa Teguisse. Charco del Palo is a brighter colour of beach, with a Naturist resort at the S end. Maybe don't look too closely...
NORTHERN TIP	004	9.9	12:51	Continue along the coast to this rocky, coastal town. Note the darker coloured beaches due to the volcanic landscape.
CALETA DE FAMARA	222	9.5	7:17	Turn hard left to proceed between Lanzarote and Isla Graciosa, until making landfall at this coastal town
GCCR -- ARRECIFE	196	10.7	4:27	Cross the island back to Arrecife Airport. Note the stunning volcanic landscape and ranges of both active and dormant volcanoes
ISLA DE LOBOS	229	16.5	6:42	Head over water straight for Isla de Lobos, which brings us to the N end of Fuerteventura.
PARQUE HOLANDES	190	8.6	3:34	Noting the lighter coloured ground, navigate to this isolated town, keeping the highway passing through it in sight
GCFV - FUERTAVENTURA	193	9.6	3:57	
GOLF CLUB	192	4.3	1:46	Leave Fuerteventura Southbound towards this green golf course, which has good contrast against its surroundings
ANTIGUA	293	7.6	3:36	Turn right towards this town at the islands centre, passing through a valley with a dry riverbed
WEST COAST	318	6.0	3:05	Keep heading towards the W coast, to complete our crossing of Fuerteventura
SOUTHERN TIP	228	31.2	12:41	Track the W coast all the way to the S tip of the island, passing the abruptly flat sands around Costa Calma, before the terrain begins to rise again
LAS PALMAS	280	49.0	22:47	Settle in on course across the ocean to Las Palmas, a hilltop outcrop with bustling town and harbour, bringing you to the N tip of Gran Canaria
INTERSECTION	176	9.5	4:07	Track S over the towns and resorts to this distinctive clover intersection. Begin to prepare for arrival at Gran Canaria, another popular holiday destination and paired with a military base home to F-18 traffic on the E side
GCLP – GRAN CANARIA	182	4.5	1:57	
ARINAGA	190	4.4	1:52	Leave the airport and track S to this town beyond a volcanic hilltop, industrial units and pier
MASPALOMAS	239	12.2	5:07	Follow the coastline towards the unspoiled sand dunes nature reserve at Maspalomas, bordered by distinctive resorts and golf clubs
SANTA CRUZ	327	56.2	28:31	Cut the corner slightly over land towards Tenerife, taking us out to sea. You will soon be able to spot the impressive Mount Teide and the islands centre
GCXO – TENERIFE NORTE	291	5.1	2:15	
JUAN FERNANDEZ	308	4.2	1:56	Leave the airport NW to the large, white, plastic greenhouses by the coast
WESTERN TIP	257	29.1	11:55	Follow the coastline to the very Western tip to experience the N coast of Tenerife island, passing the slopes of Mount Teide on your left
PLAYA DE LA AMERICAS	157	20.7	9:23	You should be able to spot the harbour, golf resort and hilltops, prepare for arrival into Tenerife Sur, our last stop. Again, be mindful of the possibility for turbulence and holiday Jet traffic
GCTS – TENERIFE SUR	090	9.0	4:00	
PLAYA DE LA AMERICAS	270	9.0	4:00	Head back to Playa de la Americas
SAN SEBASTIAN	282	19.8	9:00	Make the short hop across to Isla de la Gomera, to San Sebastian, the islands most Eastern point
GCGM – LA GOMERA	244	6.7	2:44	Pass overhead this less used airport, poised atop a dramatic cliff edge

VALLE GRAN RAY	303	7.2	3:25	Continue circulating the island to Valle Gran Ray, a coastal town with small harbour
SOUTHERN TIP	316	34.7	17:08	Leave Isla de la Gomera on a tangent to the most southern point of the next Canary Island, La Palma.
GCLA – LA PALMA	030	11:30	6:36	
SANTA CRUZ DE LA PALMA	359	3.5	1:55	Head Northbound to the familiarly named town on the shore, featuring the long ferry pier with red roofs
EASTERN TIP	037	4.1	2:23	Deviate right slightly to the most Eastern point of the island
LAGUNA DE BARLOVENTO	320	5.9	2:53	Turn inland and gain height to gain sight of this prominent round Lagoon
LAGOON	263	10.0	4:12	A second lagoon marks our next waypoint, easily seen amongst the dry surroundings as you get nearer
SOUTHERN TIP	164	20.1	9:24	Complete your lap of La Palma by returning to the southern tip, setting you up for our final crossing
GCHI - HIERRO	190	38.4	20:27	



FLORIDA KEYS



Route X21 - KEYW

Distance 335NM

Time 2H25

Legs 4

Pass alongside the impressive Cape Canaveral and track the Florida coast over Fort Lauderdale, downtown Miami, the Ocean Reef Club and then follow the Florida Keys to Key West.



TO WAYPOINT	HDG	DIST	ETE	DESCRIPTION
KTIX – SPACE COAST	170	6.7	6:41	In the distance on your left, you will find the famous space shuttle landing strip located on the vast Merritt Island. Pass overhead Space Coast and track the river Southbound
KMLB - MELBOURNE	168	26.1	11:6	After Space Coast, look further left to the expansive NASA Cape Canaveral complex, launch pads and landing strips. Pass overhead Melbourne Airport
KSUA – WITHAM FIELD	164	59.6	24:48	
PRATT + WHITNEY	213	18.4	7:59	Head South West inland to the Pratt + Whitney aero engine testing facility, found cut into the trees in the otherwise dark countryside, complete with runway and race track
KPHK – PALM BEACH	253	18.5	8:20	Track South West across the farmlands to pass over Palm Beach Co Glades airport, found on the Eastern shoreline of Lake Okeechobee
HILLSBORO CANAL	151	29.9	13:38	Keep the town of Belle Glade on your right and you will soon pick up the Hillsboro Canal right ahead of you towards the coast, which you can follow to the beach airport of Boca Ration
KBCT – BOCA RATON	096	14.2	6:56	
KPMP – POMPANO BEACH	188	7.9	3:45	Leave to the South to find Pompano Beach airfield, bordered by golf courses, clover intersection and canals
KFLL – FT LAUDERDALE	197	10.8	5:07	Track parallel to the coastline South to cross right overhead this major international hub
BAKERS HAULOVER	179	10.4	4:58	Entering the Northern tip of Miami Bay, Baker Haulover is a short bridge that is found at the bay entrance
NORTH BAY ISLAND	218	3.5	1:42	Tour the magnificent Miami Bay and see the beach out your left window the whole way South
VIRGINIA KEY	189	7.0	3:21	Passing the iconic Miami Beach on your left and City on your right, proceed Southbound to this island, identified with two large bridge accesses
07FA – OCEAN REEF CLUB	200	25.3	12:11	
INDIAN KEY FILL	225	33.0	15:54	Track the idyllic Keys to Indian key, where the long bridge can be seen as the Keys begin to space apart
BIG PINE KEY	256	40.3	19:12	Keeping the Keys on your left, continue to take in the iconic scenery towards the larger Big Pine Key
KEYW – KEY WEST INTL	258	23.0	16:16	

GOLD COAST



Route	YBBN - YSBK
Distance	453NM
Time	3H20
Legs	5

The Australian Gold Coast is a major destination for people the world over. Famed for its expansive beaches. Circle around Sydney and take in the iconic skyline.



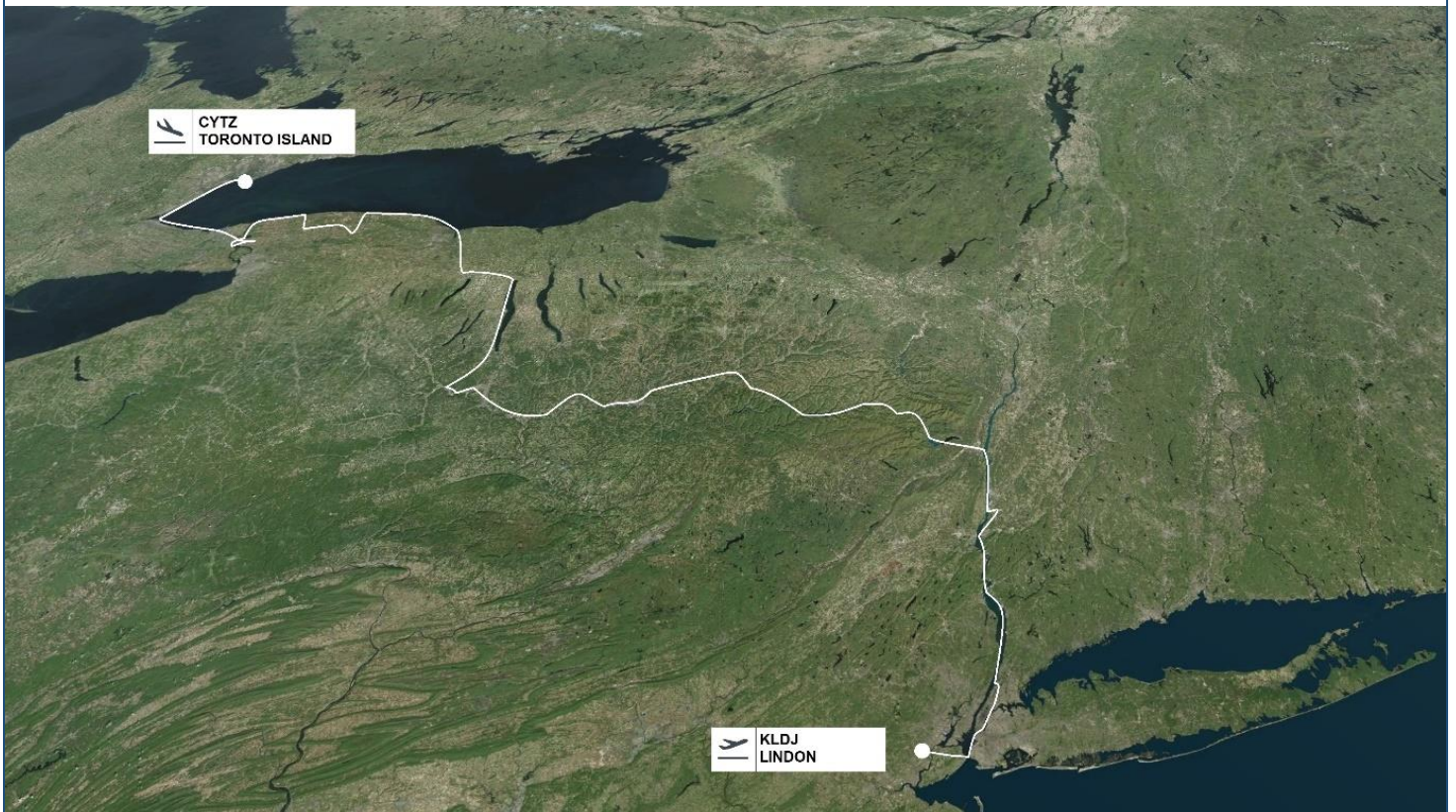
TO WAYPOINT	HDG	DIST	ETE	DESCRIPTION
YBAF - ARCHERFIELD	198	13.3	13:19	Leave Brisbane, Queensland's capital, heading South West to fly overhead Archerfield, which has two paved RWYs and two grass RWYs
ADVANCETOWN LAKE	142	33.0	14:20	Start heading towards the coastline to this jagged lake, the city of Gold Coast off your left wing, famous for long sandy beaches and intricate canal system
BYRON BAY	140	39.1	16:38	Continue along the coast to the world--renowned SCUBA diving spot of Byron Bay, which juts out into the ocean
YBNA - BALLINA	187	12.3	4:51	
PIMLICO ISLAND	203	6.1	2:31	Follow the river, parallel to the coast to where Pimlico Island briefly divides the river into two
YAMBA	181	31.3	12:48	Keep tracking the coast South to Yamba, noted for the sandy beaches and river inlet
WOOLGOOLGA	179	41.7	16:49	Track still further South to this popular beach destination
YCFS – COFFS HARBOUR	189	13.8	5:29	
SAWTELL	177	3.0	1:13	Leave Coffs Southbound to Sawtell, which features a town and golf course
NAMBUCCA HEADS	184	17.1	6:48	Identified by large swathes of sand banks and located on a ridge, proceed South to Nambucca Heads
YPMQ – PORT MACQUARIE	177	48.0	18:46	
RESERVOIR	215	6.7	2:43	Distinctively dark and featuring a dam wall, pick up the route from this reservoir
TUNCURRY	185	41.8	17:01	Following the pacific coastline, continue Southbound until the coast splits at Tuncurry and Forster, with a bridge connecting the two towns
YWLM – WILLIAMTOWN MILITARY	210	50.6	20:24	
STOCKTON	187	7.6	3:28	Resume your journey South by aiming for the distinctive Stockton teardrop shape and bay, forming a part of a large urban district and features dark black coal piles to the West
THE ENTRANCE BRIDGE	197	29.1	12:47	Fly South along the full length of this system of idyllic bays, until the bridge at the most southern bay
PALM BEACH	198	16.9	7:25	Begin our approach into the Sydney area at Palm beach, found where the coastline is broken
MANLY	176	13.3	5:54	Identify Manly by its hillside and curved beach with urban areas and golf courses
M1 HIGHWAY	231	4.0	1:47	Avoiding the Sydney International control zone, turn right to this wide double bridge junction on the M1 highway Westwards. On your left is the Sydney Opera house and Bridge
PROSPECT RESERVOIR	259	16.0	7:35	Looking out for International Jet traffic, continue Westbound past Sydney City and bay to this large reservoir
YSBK – BANKSTOWN	129	7.9	7:37	

NYC to TORONTO



Route	KLDJ - CYTZ
Flightplan	Niagara.PLN
Distance	510NM
Time	4H50
Legs	8

Leave the bustling New York City up the Hudson to embark on a cross country adventure taking you through glorious green countryside dotted with towns and cities. View the spectacular Niagara Falls from a new vantage point before making the border crossing to Canada.



TO WAYPOINT	HGD	DIST	ETE	DESCRIPTION
VERRAZZANO BRIDGE	106	9.2	9:10	Head E to the distinctive Verrazzano-Narrows toll bridge, connecting Brooklyn and Staten Island. Named after the Italian explorer, his ship being the first to enter NY Harbour, it was the world's longest suspension bridge when it was completed in 1959
GOVERNORS ISLAND	025	4.3	4:49	Head N to this previous military outpost, now open to the public and features the large cylindrical tunnel air vent at the N end. Be very vigilant for fixed wing and helicopter traffic. We are going to follow the right-hand side of the East River flying route
BROOKLYN BRIDGE	055	2.0	2:06	Take in the glorious NYC skyline as you head into the East River over the Brooklyn and Manhattan bridges
EAST RIVER	070	1.6	1:42	Track the right-hand side of the East River, keeping a lookout for traffic
BIG ALLIS	032	2.6	3:05	Continue to right side of the East River passing Big Allis, a distinctive 1960's natural gas power station. On your left wing is the start of Central Park
HARLEM RIVER	034	2.5	3:08	Tracking left at Wards Island, follow the Harlem River keeping Upper Manhattan on your left.
SPUYTEN DUYVIL	017	4.7	6:15	Continue up the Harlem River to the two bridges at Spuyten Duyvil. The further bridge is for railway traffic and must be swung open and shut to allow boats to pass
CROTON BAY	019	18.5	10:42	Turn right to follow the right-hand side of the Hudson towards this easy to spot outcrop and train depot
TOMKINS COVE	331	5.1	2:56	Tomkins Cove is where the Hudson narrows with a quarry on the left. Continue N up the Hudson
HAMILTON BRIDGE	010	16.3	9:52	Keep tracking the Hudson. entering the vicinity of Stewart International, towards the double Hamilton Fish Newburgh-Beacon Bridge. The North bridge carries Westbound traffic, whilst the Southern bridge carries Eastbound.
KPOU - HUDSON VALLEY	052	8.1	4:26	
CROWN HEIGHTS	297	2.5	1:18	Leave Hudson Valley towards the large quarries of Crown Heights, to resume out trip N on the Hudson River
KINGSTON	009	17.0	9:51	Keep tracking the Hudson until the town of Kingston, identifiable by the bridge and inlet. We will leave the Hudson here to the W
ASHOKAN RESERVOIR	300	13.6	6:56	Depart the Hudson River to the W and pick up the jagged outline of the reservoir to its NE side
SHANDAKEN	339	10.1	6:01	Leave the NW tip of the reservoir and track the valley. The Catskills Mountains are on your left. Identify Shandaken by its Y shaped fork in the road, heading left at the fork
BIG INDIAN	263	2.6	1:06	A short stretch to Big Indian, keep following the road along the valley
FLEISCHMANN'S	321	5.1	2:46	You can spot the industrial warehouses at the base of the valley at the W end of town
MARGARETVILLE	279	4.7	2:08	Still valley tracking, Margaretville is a slightly larger town with a bridge across a river at a narrow point.
DOWNSVILLE	267	15.0	6:33	Leaving Margaretville to the SW, following the river, the river will soon widen out into the snake-like Pepacton Reservoir. Downsville is found at the very W end of the reservoir.
WALTON	322	9.6	5:05	Nestled between the valley walls, Walton is a mid-size town with a bridge, sports ground and two large H shaped buildings
TROUT CREEK	301	6.5	3:17	Leaving Walton to the NW, find Trout Creek at the Y shaped fork of two valleys, a small town with a crossroad at the centre
N23 – SIDNEY MUN	328	8.5	4:30	

BAINBRIDGE	265	2.6	1:12	Head W to the highway junction at Bainbridge
AFTON	218	4.3	1:50	You can identify Afton by the looping highway exit, round lake and dirt raceway
CHANAGO BRIDGE	271	16.3	7:33	Follow the sweeping highway until the Chanago Bridge, where the highway takes a hard left and is joined by a river, that will lead S
BINGHAMPTON	217	4.7	2:05	Follow the river until the T at central Binghampton
KCZG – TRI-CITIES	277	8.0	3:42	
OWEGO	295	7.6	3:35	Leaving Tri-Cities to the W, follow the river to Owego, where the river bends left
HOOPERS VALLEY	247	8.2	3:42	Further W along the Susquehanna River, find the oval Tioga Downs Racetrack and casino resort
CHEMUNG	272	9.1	4:11	Continuing W, you will spot the gravel piles and light blue water to identify Chemung, along with the highway junction to the NW
ELMIRA TOWN	315	9.9	4:43	The highway continues NW to Elmira, the largest city of Chemung County. Find the central point where the bridges cross the river near downtown
KELM - ELMIRA	332	5.9	2:47	
CORNING	277	7.6	3:30	Turn right from Corning to follow the road NE in the valley. This will take you past the purple roofs and along the widening railroad tracks
WATKINS GLEN RACETRACK	040	12.8	6:19	Towards the S base of Lake Seneca, you will find the sprawling Watkins Glen International race circuit. Hosting NASCAR and GT race events on the world
GENEVA	009	32.1	15:21	Track the full extent of the Seneca to Geneva at the very N tip
KIUA - CANANDAIGUA	291	15.5	7:26	
INTERSECTION	352	5.5	2:37	Depart to the N along the highway until reaching the junction with the 90 NY State Thruway toll road, which we will follow to the W
LAKE LACOMA	317	5.9	2:49	With the 90 diverging to your left, follow the split in the highway to the right, forming the 490 to Lake Lacoma, overhead the dark roofed Eastview Mall and shopping super centres. The lake is in the suburbs just south of the large bend in the brown coloured Erie Canal
QUARRY	012	5.7	2:42	Head straight N from Lake Lacoma, over the Erie Canal bend, keeping Rochester city on your left. You will arrive at this distinctive quarry with blue water, found just SE of Irondequoit Bay, which leads to the grand S shore of Lake Ontario
HARBOUR	348	5.8	2:47	See the vast metropolis of Rochester City on your left, track up the Irondequoit Bay with bridge halfway up until reaching the bay entrance
BRADDOCK BAY	317	9.5	4:58	We head NW, keeping the Lakeside on our left, past Rochester and paralleling the Lake Ontario State Parkway road until Braddock Bay
HIGHWAY END	289	22.9	12:47	Parallel the full length of the Parkway road on your left until the highway ends with a junction, we will head back S inland from there
ALBION PRISON	187	7.2	3:36	The W side of Albion town hosts a prison complex with white roofs, leading us in towards our next stopover at Pine Hill airfield
9G6 – PINE HILL	222	4.8	2:25	
MEDINA	313	5.6	2:42	Leave Pine Hill NW to Medina, where a town bends around the S end of Glenwood Lake
LOCKPORT	269	13.7	6:54	Head W to the larger urban centre of Lockport
OLCOTT	005	10.1	4:49	Track N all the way back to the lakeside where we find a river leading to Lake Ontario, ending at the clearly identifiable harbour at Olcott
YOUNGSTOWN	263	14.5	7:39	Pick up the Niagara Scenic Parkway road and track it until it forks. We will follow the left fork S, which will bring us in towards Niagara for the best view
LAKES	187	7.2	3:40	Continue S on the Parkway to the 7-sided light blue Fish Creek lake where the bridge crosses. You will be seeing the rapids and Falls any time now

NIAGARA FALLS	222	4.3	2:09	Feel free to take a few circles around this spectacular site. Niagara Falls is made up of the three falls, the largest of which is Horseshoe Falls. Keep an eye out for other GA traffic and the tall buildings and observation tower on the W side.
KIAG – NIAGARA FALLS	085	5.8	2:42	
LAKES	314	4.0	1:55	Track NW back to the Lakes
ST CATHARINES BRIDGE	293	11.1	5:20	Proceed ahead to this bridge, located where the river widens towards Lake Eerie
HAMILTON BEACH	298	23.7	11:35	Follow the highway along the shore, keeping it on your left. Hamilton Bridge is in the middle of the narrow stretch at the base of the smaller triangle shaped lake.
HUMBER BAY	046	24.0	10:18	Keep the shore on your left as you track NE towards Toronto. Humber bay features boat moorings with tall buildings.
CYTZ – TORONTO ISLAND	092	3.5	2:41	



NEW ZEALAND



Route NZWR - NZWN

Flightplan NZ.PLN

Distance 493NM

Time 4H15

Legs 8

Tour the beautiful North Island of New Zealand. With relatively quiet skies and plenty of open space, head North to South over this marvellously varied countryside. Complete with coastline, mountain ranges and major cities.



TO WAYPOINT	HDG	DIST	ETE	DESCRIPTION
MARSDEN POINT	105	7.7	7:40	We commence our journey of New Zealand's North Island tracking South East to Marsden point, a town on the far corner of the bay leading towards the ocean
WELLSFORD	158	27.2	31:17	Track Southbound across the Northern peninsula to Wellsford, found at a point North of Dome Forest and East of the bay system
WHENUAPAI AFB	151	30.0	15:41	Track overhead this NZ Air Force base as we set up for a scenic pass of Auckland
MISSION BAY	089	10.5	5:11	Cross the scenic Auckland skyline, featuring the Sky Tower and double bays
MANGERE BRIDGE	183	5.7	2:57	Turn South to the entry point to the Auckland CTZ, we are going to pass overhead NZAA and the Mangere bridge is our way in
NZAA - AUCKLAND INTL	161	4.3	2:13	Go straight overhead the major international airport
WEYMOUTH	106	4.4	2:12	Our Southern CTZ exit is Weymouth, located at the entrance to Pahurehure inlet
PAPAKURA	083	3.6	1:43	At the end of the inlet is this easily identifiable town, setting us up for arrival at the Uncontrolled Ardmore airfield
NZAR - ARDMORE	025	2.7	1:15	
PAPAKURA	205	2.7	1:22	Leave Ardmore to head back towards Papakura
DRURY	146	2.5	1:17	Locate Drury along the highway with its white industrial buildings
PUKEKOHE	172	6.8	3:30	Find Pukekohe racecourse to the South of the town, oval in shape and near the white buildings
LAKE WAIKARE	116	15.7	7:53	Track over the Waikato river towards the North West corner of the soft edged Lake Waikare
HUNTLY	160	8.50	4:14	Head towards the power station on the rivers western bank, located near Lake Waahi
NGARUAWAHIA	161	7.3	3:35	Continue along the Waikato to this town found on the other side of the dark forested hills
TEMPLE VIEW	139	10.3	5:00	Our entry to the Hamilton CTZ takes us to Temple View, a large white temple on a hillside
RUKUHIA	095	4.1	2:00	Tracking inbound to Rukuhia, located roughly on the downwind leg, look for intense GA training aircraft traffic, as a major flying school is based here
NZHN - HAMILTON	091	1.4	0:43	
CAMBRIDGE	086	7.0	3:32	leave the zone to the East at Cambridge, a standout location further down the Waikato river
MORRINSVILLE	350	14.7	7:29	Heading North to Morrinsville, you should be able to locate the town as it is surrounded by sparsely populated countryside
TIROHIA	006	14.5	7:17	Continue North East to the entrance of the Waihi pass. Keeping the tall ridge line of Te Aroha on your right and the wide marshlands on your left
WAIHI	051	9.2	4:39	Enter the Waihi pass, keeping a lookout for GA traffic. Aim for the deep quarry found within the town
WAIHI BEACH	088	5.2	2:34	Track South East to the beach
MOUNT MANGANUI	121	17.0	8:12	Mount Manganui is easy to spot as its broad hillside and prominent location makes it a standout landmark and forms the Entrance to the Tauranga CTZ
NZTG - TAURANGA	132	2.8	1:21	
RACECOURSE	205	5.0	2:05	Depart Tauranga to the South West to the racecourse that forms the CTZ exit, located near the highway and golf course beyond the bay
TE PUKE	089	10.0	5:17	Te Puki is surrounded by dark paddocks and is found on the other side of the hill ranges

LAKE ROTORUA	176	16.5	6:49	Fly to the North West tip of Lake Rotorua
NZRO - ROTORUA	107	5.5	2:49	
ROTORUA	212	3.3	1:20	Leave the airfield toward Rotorua town, famous for geothermal pools and springs
LAKE OHAKURI	182	17.9	7:33	Pick up the North Eastern tip of the Y shaped Lake Ohakuri as it widens to the centre
LAKE ROTOKAWA	145	13.3	6:15	Track the Southern leg of the Lake towards this lighter blue Lake, near the geothermal energy facility
NZAP - TAUPO	196	8.2	3:39	
LAKE TAUPO	233	13.0	5:39	Departing West to the nearest edge of the Lake
TONGARIRO FOREST	205	19.0	8:14	Find this point within the Tongariro Forest near the Northern tip of the paths cut into the treeline on the hill. West of Lake Rotoraira and surrounded by darker forest
RAETIHI	185	26.9	11:53	Pass the stunning Tongariro and Ruapehu Mountains on your left and find the flatter paddocks leading to Raetihi town
WHANGANUI TOWN	177	32.0	14:6	Proceeding South West on track over the countryside, you will start to pick up the winding river that gradually widens towards Whanganui town with its river entrance at the coastline, the only major town in the area
NZWI - WANGANUI	199	2.4	1:03	
PRISON	088	3.4	1:44	A short distance to the South East brings you to the square white buildings of the prison complex
TANGIMOANA	141	19.8	9:10	Continue along the Western coast toward this narrow river mouth
OTAKI BEACH	169	27.0	12:09	Further down the coast you find another river mouth paired with the rectangular Otaki Beach, the entry point for Paraparaumu
NZPP - PARAPARAUMU	189	11.5	4:51	
PUKERUA BAY	188	8.7	3:40	Flying along the coastline, find Pukerua Bay, where a winding highway and railway continue to the South West slightly more inland
PAREMATA	170	4.4	1:56	At the end of the railway and highway stretch, you will find a bridge at the western end of Porirua Harbour
HAYWARDS	098	5.8	2:47	Turn left over the bay to the South East, where you will find Haywards on the slope down to the valley bottom, identified by its large array of power transmission equipment and pylons
SOMES ISLAND	197	8.2	3:40	Follow the valley South West until entering the lake and continue across to Somes Island, our entry point for Wellington CTZ
POINT GORDON	188	2.6	1:11	Set up for the approach towards Point Gordon, the most Easterly tip of the peninsula at the North end
NZWN - WELLINGTON	193	2.2	2:06	

LA to BRYCE CANYON



Route	KSMO - KBCE
Flightplan	Vegas.PLN
Distance	687NM
Time	6H00
Legs	9

Cross the stunning landscapes spanning Nevada, Arizona and Utah on this memorable journey out of LA. Pass the scorching heat of Death Valley, the vibrant sprawl of Las Vegas, look deep into the iconic Grand Canyon and complete your journey at Bryce Canyon.



TO WAYPOINT	HDG	DIST	ETE	DESCRIPTION
SANTA MONICA PIER	245	2.5	2:27	Pass the famous Santa Monica beach and head to the pier. Start your nav timer when heading back Eastbound to the following waypoint
DODGERS STADIUM	060	13.5	13:37	Head towards the sprawling Los Angeles metropolitan area until the end of the mountain side on your left until you find the large Dodgers baseball stadium, keep an eye out for the Hollywood sign on your left
VAN NORMAN RESERVOIR	305	18.0	19:01	Pass into the San Fernando valley towards this standout reservoir
WILLOW SPRINGS RACEWAY	005	36.2	18:36	Head North though the Glendale gap in the hills, keeping Burbank on your left and climbing over the mountain range, keep Lancaster City on your right all the way to Willow Springs race track, found at the base of the hillside
KTSP – TEHACHAPI MUN	318	18.0	9:09	
KOEHN LAKE	058	28.6	14:01	Make your way on a straight leg towards the very Southern tip of the dry Koehn lakebed, just beyond the oval vehicle test track
SEARLES LAKE	031	36.6	17:23	The multi-coloured pools of Searles Lake will slowly come into view, threading your way between restricted airspace
L72 - TRONA	004	5.5	2:44	
RIDGE CROSSING	036	7.5	3:40	Cross the ridgeline at this low point to cross over into the next valley
TURNING POINT	139	11.4	5:17	Track the valley line to this turning point, where a new valley opens up to the left
L61 - SHOSHONE	057	43.0	20:38	
RIDGE ENTRY	037	2.1	1:04	Follow the highway north East to enter cross the ridge
RIDGE EXIT	061	1.9	0:57	The highway turns right then left, follow it through the ridge crossing
HIGHWAY BEND	115	20.1	10:09	Track this great stretch of highway until it bends slightly to the right near the hillside
PAHRUMP JUNCTION	048	11.0	5:00	Continuing along the highway you will see a town appear, which features a T junction with another road
HIGHWAY BEND	114	20.0	0:09	Follow the new road to the right down another impressive stretch until it begins to weave
MOUNTAIN SPRINGS	070	7.0	0:03	Follow the turns in the highway to find your way between the hillside
HIGHWAY BEND	112	3.0	0:01	Cross the ridge, still following the highway
BLUE DIAMOND MINE	033	5.1	2:36	Entering the Vegas area, we track to the Blue Diamond Gypsum mine, just beyond the small town
SLOAN MINE	116	10.5	5:06	Watching out for GA traffic, another mine is found to the South East, passing over the square edged neighbourhoods near the major highway junction
KHND – HENDERSON EX	054	4.3	2:09	
HENDERSON VALLEY	074	4.6	2:18	Departing to the East presents you with Henderson Valley, a break in the hillside
RAILROAD PASS	077	6.0	3:00	Crossing another ridge, find the crossing point where the highway is met by a railroad, continue following the highway through the ridge
KBVU – BOULDER CITY	113	3.3	1:37	Pass overhead Boulder Airport
HOOVER DAM	043	7.0	3:34	Find the world-famous Hoover Dam at the Southern end of Las Vegas Bay
U30 – TEMPLE BAR	076	19.6	9:52	Cross overhead Temple Bar airfield, which can be difficult to pick out amongst the dry land. Expect to arrive perpendicular to the runway.

1G4 – GRAND CANYON WEST	082	25.2	12:52	
QUARTERMASTER CANYON	154	3.1	1:33	Locate the first canyon to the South of the airfield. There are No Fly zones across the canyon which we need to avoid by keeping to the south side
SPENCER CANYON	128	10.9	5:36	Spencer canyon departs the main canyon where the river turns sharp left
DIAMOND CREEK	087	14.6	7:36	Track the main canyon and river to its Southern point, a straighter canyon stretches South, helping identification
TWIN PEAKS	356	21.6	10:30	Head North along the Grand Canyon to the Twin Peaks, where the canyon turns East
SUPAI	064	30.2	15:09	Supai is found, as a rare green strip of trees at the base of a canyon stretching South
THE RANCH	113	23.2	12:02	Nearing our next stop, orientate yourself by locating this singular lake
KGCN – GRAND CANYON NATIONAL PARK	105	8.1	4:12	
THE RANCH	285	8.1	3:44	Return to the The Ranch to set us up for our Canyon crossing
DRAGON CORRIDOR	014	16.5	8:04	Head North East through Dragon Corridor, one of the designated crossing points, avoiding No Fly areas. make sure to keep accurate headings through the corridor
MARBLE CANYON	025	41.7	20:45	Track Marble Canyon and see it narrow to a tip at the Northern end
KPGA – PAGE MUNI	042	10.9	5:24	
WAHWEAP	325	4.1	1:54	Straight North of Page is Waheap, where a marina is located and you can see the parking areas against the landscape
LAKE POWELL	057	30.4	15:19	Continue over Lake Powell until you see this fork in the water, we will follow the left fork
ESCALANTE RIVER	320	37.2	16:47	The left fork from Lake Powell narrows more and more, becoming the Escalante River, follow the river until the land lightens in colour
1L7 – ESCALANTE MUNI	265	14.2	6:44	
WIDE HOLLOW RESERVOIR	296	4.0	1:56	Leave Escalante north West to this readily identifiable reservoir, setting you up for a left turn for the next canyon
CANYON	229	2.8	1:23	Cross the hillsides through this canyon pass, which diverges into several smaller canyons
HENRIEVILLE	219	18.8	8:57	At the far side of the canyon, see the first signs of green land, marking Henrieville
PINK CLIFFS	229	10.5	5:01	Track South West to the bottom of Bryce Canyon, turning here at the lead up to Rainbow Point. Find the turn point where the landscape begins to take a pink hue
TROPIC	016	10.1	4:53	Explore the Canyon northbound, marvelling at the picturesque Bryce Canyon on your left. Find Tropic where the land turns green, with baseball pitches and blue roofs
RUBYS INN	294	4.5	2:09	On the next hilltop to the left, locate Ruby's Inn, a popular stopping point and characterised by the large parking areas and campsite
KBCE – BRYCE CANYON	002	2.4	2:28	

ALTIMETRY

Indicated Altitude & QNH

The air pressure is reported in a METAR as it gives indications of many factors. Knowing the local air pressure at your departure and destination is important, as it is used to define your altitude above sea level. To explain this, we will briefly discuss how an altimeter operates.

An altimeter works much like a pressure gauge that indicates in reverse. It contains a sealed chamber, which maintains a constant pressure. As an aircraft climbs, the air pressure outside reduces, causing the chamber to expand. The higher you fly, the lower the air pressure and the more the chamber expands. The exact expansion of the sealed chamber is precisely calibrated, allowing the expansion to drive a needle, accurately indicating aircraft altitude.



There is an important distinction to be made between height and altitude. Height is the distance above the ground below, whereas altitude is the distance above the worldwide average (mean) sea level, MSL.

It would be difficult to use height above ground level (AGL) as a reference for aircraft, as the elevation of the terrain below changes massively from place to place. To fly a constant height above ever-changing terrain would mean continually climbing and diving to keep the ground at a fixed distance as you traverse valleys and mountain ranges, which is clearly not ideal. Using an airfield elevation as your reference is not much use either, as airports can be located at very different elevations. Anything from sea level (or even slightly below MSL in the case of Amsterdam) to thousands of feet up a mountain range is possible. Also, another aircraft would be using another airfield as their reference, giving very inconsistent results.

The mean sea level is a good reference for aircraft as it provides a reliable and consistent datum around the world. Therefore, all aircraft can use MSL as their altitude reference, allowing for greater consistency and safety.

So, while the sea level remains constant, what does change from day to day is the air pressure. As an altimeter is a pressure gauge that indicates in reverse, if the pressure drops overnight, the altimeter would show an increase in altitude, even while the aeroplane is parked in the hangar. To compensate for these changes, the local air pressure is reported on METARs, in units of hectopascals (hPa) or inches of mercury (in Hg) and is known as the QNH.

The QNH is dialled into the altimeter before takeoff or landing and will correct for any localised variations in pressure. Each 1hPa of pressure equates to around 30ft. When QNH is set correctly, the altimeter will display altitude Above Mean Sea Level (AMSL). This means that when on the ground, rather than indicating zero feet, the altimeter will display the aerodrome elevation. If you wind the setting so that zero feet is displayed, you are now indicating your height Above Airfield Level (AAL). The pressure setting required to indicate zero is known as the QFE, but this is rarely used and generally not included in weather reports.

In the USA, the convention is to use units of Inches of Mercury, which is reported as A2992 to represent 29.92 inches, the standard setting and is equivalent to the standard QNH of 1013 hPa. Most altimeters allow use of either unit.

Radio Altimeter

When closer to the ground, most larger aircraft have a separate method for measuring the current height over the ground (AGL). This is done with the use of a Radio Altimeter or RADALT. This system sends a radio beam directly downwards from the aircraft and measures how long it takes to be reflected back. As the radio beam travels at the constant speed of light, by measuring the round-trip time the RADALT computer can very accurately determine the aircraft's height over the ground at that moment.

Only effective at relatively short ranges, a RADALT can provide a very clear and accurate height up to roughly 2500ft, where most systems will automatically remove the needle or display from view.

These systems are most effective for the late stages of landing, where completing a landing in marginal weather requires the most exacting figures available.

Flight Levels

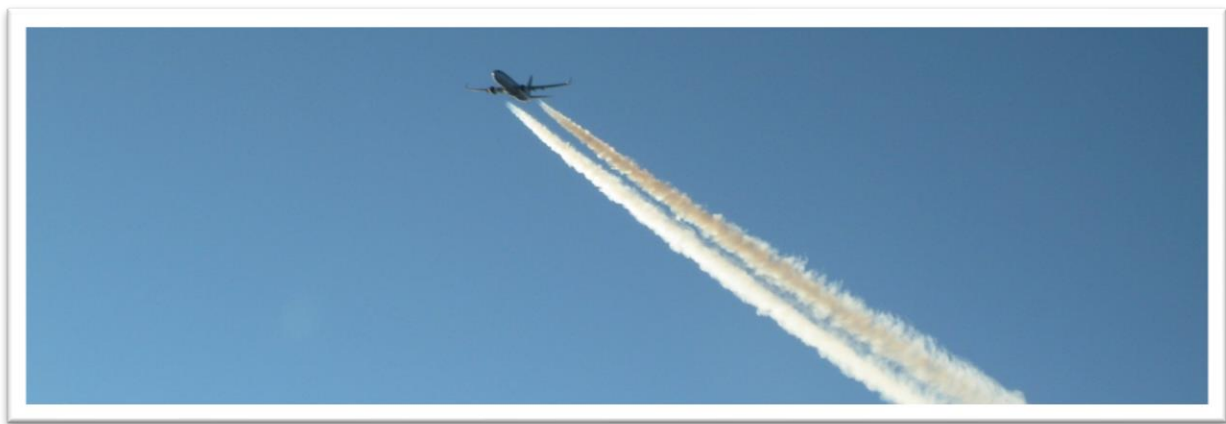
We have discussed altitudes based on height above ground (AGL) and height above sea level (AMSL). Using these as a reference for measuring altitude works very well at lower levels and for short range flights.

Problems can begin to appear however when longer distance travel is desired. If using the local QNH to give Altitude AMSL, your altimeter will only read correctly if you stay nearby to the airport the QNH is based on or if you continually obtain and set each local QNH as you pass by. This would be quite tedious, time consuming and open to error.

A factor to also account for is that other aircraft flying from other places will have other QNH settings dialled in. We can see a mess beginning to emerge, especially in today's busy skies.

A solution is needed and it comes in the form of Flight Levels.

A Flight Level is an altitude based on an internationally standardised QNH of 1013. It is agreed that all aircraft flying at or above a certain altitude will use Flight Levels as this ensures that all aircraft enroute throughout the globe are all using the same QNH setting of 1013, thereby ensuring safe clearance between aeroplanes.



The altitude at which you transition to using Flight Levels is called the Transition Altitude (TA) and this varies from airport to airport, depending on local airspace and topography.

The minimum available Flight Level is called the Transition Level (TL). The gap between these two is referred to as the Transition Layer.

To clearly distinguish between an Altitude and a Flight Level, there is a difference in terminology and presentation. A Flight Level is presented with a preceding "FL" and three figures for that altitude in hundreds.

For example; 15,000ft is equivalent to FL150.

To set a Flight Level, you simply set the QNH on your altimeter to 1013. Some aircraft have an ability to easily toggle between the local QNH and 1013 which is often labelled "Standard" or "STD".

CRUISING LEVELS

When flying a route, you need to choose a compatible altitude to fly. There is a simple system in place for this, designed to avoid two aircraft approaching each other head-on at the same altitude. The altitude you choose depends on the direction you are flying for that leg.

If flying **VFR** (Visually) above **3000ft AGL** (Above Ground Level) then pick an **EVEN** altitude when flying **WEST** or an **ODD** altitude when flying **EAST**. Then add 500ft.

The same rules apply when flying **IFR** (On Instruments) but without the +500ft.

← TRACKING WEST	TRACKING EAST →
EVEN +500ft	ODD +500ft

For example, if flying **VFR** and your **HDG** to the next waypoint is **070**. An **ODD** altitude +500ft would be chosen, such as **5500ft**.

This system continues all the way up to the **Transition Altitude**, which is the highest available altitude for your region before the **Flight Level** system begins to be used instead.

MINIMUM FLIGHT ALTITUDES

It is the responsibility of the Commander that the aircraft is not allowed to be flown below any particular MFA except for the purposes of Takeoff and Landing. The purpose of most minimum altitudes is to avoid conflicts with terrain and obstacles, but can be put in place for airspace requirements or navaid reception limitations, amongst others.

These altitudes are absolute minimums and are to be increased depending on factors such as temperature changes, air pressure and wind speed. ATC will not necessarily include such adjustments in their clearances, so knowledge of these MFAs is important.

There are a few different ways of determining the MFA for a particular moment, so we'll touch on each of them in turn.

MSA

Minimum Sector Altitude

Within a 25nm radius of an airport or navigational aid, 1000ft clearance is given above the highest terrain or obstacle in that area, giving the MSA.

This 25nm area can be divided into sectors with each sector allocated its own MSA, to account for high terrain in one particular zone nearby the airfield.

MDRA

Minimum Off-Route Altitude

For a particular route, an area 10nm each side of the route centreline is considered for terrain and obstacles. 1000ft margin is given above surrounding terrain that is no taller than 5000ft. For higher terrain, a 2000ft margin is applied.

MGA

Minimum Grid Altitude

An enroute chart is divided up into a grid pattern, with each grid square defined by lines of latitude and longitude. The highest terrain or obstacle within each grid square is taken and has a safety margin applied to it to define a minimum safe altitude. The margin varies slightly depending on the chart producer, but is generally 1000ft for terrain up to 6000ft, and 2000ft margin above terrain exceeding 6000ft. In some regions, including parts of France, airspace and danger areas are also considered as obstacles for this calculation.

AIRPORT FACILITIES

PAPI

Runways come in all shapes and sizes. With some experience, you will become used to judging your approach angle to the runway, based largely on how the runway appears in the window. However, there are many factors that can cause some visual illusions, making it difficult to assess your approach.



A long runway can make you look high, whereas a wide runway can make you appear low. Terrain, runway slope and other features cause these kinds of confusions, which is a known problem for pilots.

To make your approaches easier, approach path guidance lights have been developed, which use a colour coded set of lights to easily guide you down the approach. The most common of these is the Precision approach path indicator, or PAPI.

PAPIs normally have 4 lights, set out in a row side by side. The lights are colour coded in the following way:

□	□	□	□	All White	Too High
□	□	□	■	3 White	Slightly High
□	□	■	■	2 Red & 2 White	Correct
□	■	■	■	3 Red	Slightly Low
■	■	■	■	4 Red	Too Low

You want to keep 2 reds and 2 whites, all the way down the approach. If you see 3 reds, for example, you are slightly low and need to reduce your rate of descent. PAPIs lose their accuracy

just before touchdown, so once reaching roughly 100ft, shift your focus to the aiming point markings on the runway, which we will look at next.

VASIS

Another variation on approach path indicators are Visual Approach Slope Indicator Systems (VASIS). They follow a similar red/white logic as a PAPI, but are configured differently.

VASI systems are arranged into two or three bars of lights. When two bars are installed, you are looking for one bar to be white and the other red, indicating you are on the correct glidepath.

All white or all red have the same too high/too low logic as a PAPI.

When three bars are used, you only use two of the three. Which of the three bars you ignore depends on your aircraft type. Most aircraft will use the lower two bars, disregarding the top bar of lights. If flying a wide body, long haul airliner, the top two bars are utilised, and the bottom bar is disregarded. This would apply if flying a 747, 757, 767, 777, A380 etc.

RUNWAY MARKINGS

Runways have a system of painted markings, which are mostly standardised internationally, for making the runway easy to see and use. Not all runways have a full set of markings, as smaller airfields don't require them, but large airports will typically have a fully lit and marked runway.



The centreline of most runways is marked, making it easier to stay central when taking off and landing, especially in the case of a crosswind, or an engine failure in a multi engine aircraft.

To help you touch down in the correct spot on the runway, there is an aiming point marked out, within a touchdown zone. The zone will be marked by repeating double lines. You should not touchdown and further down the runway than the last of these lines. If it looks like you won't land within the touchdown zone, you should go-around, as otherwise you might not have enough runway to stop. The aiming point is the centre of the touchdown zone and is marked with large, wide markings.

For landing, the aiming point should be kept in a constant position in the cockpit, and is literally aimed at until you start the landing flare.

Runways will have numbers, defined by their magnetic direction. For example, a runway that points directly West, which is 270 degrees, will be numbered runway 27. If an airport has parallel runways, they will also be designated with Left and Right.

The stripes at the ends of the runway, commonly called the piano keys, make the runway ends easier to see and also are an indication of the runway width. A standard 45m wide runway will have 12 piano keys, whereas a 60m wide runway would have 16.

Typically, the whole runway length can be used for taking off, although Depending on what terrain and obstacles are on the approach to a runway, the full length may not be usable for landing. This unused length is called a displaced threshold and is shown by arrows. You can begin your takeoff here, but you must not touch down within this threshold. If the threshold has yellow chevrons, they are not to be used takeoff or landing and are simply there as extra runway for emergencies.

RUNWAY LIGHTING

Runways are of course used night and day, so a system of lighting is usually put in place. The green bar shows the beginning of the runway, the red shows the end. As you near the end of the runway, the centreline lights will become alternating white and red, showing 900m remain. Towards the very end, the centreline turns all red as you reach the last 300m.



The painted aiming point can't be seen at night, so this too has a lighting system on large runways. Many rows of light bars stretch from the runway start until up to 900m down the runway. This indicates the touchdown zone, as we discussed earlier, with the aiming point in the middle.

Only the largest runways have the full system of lighting and marking, and there are many variations, but now you know the basics and can apply this knowledge when needed.

TAXIWAY MARKINGS

Large airports can be a maze of taxiways and aprons. Finding your way can be easier said than done. A system of taxiway lights and markings has been developed to help guide you.



The most basic taxiway marking is its centreline. Painted yellow to differentiate itself from runway markings, a taxiway is marked by its centreline. By keeping the aircraft on the centreline, you can be sure that you will be clear of buildings and obstacles and that the surface is strong enough to support your aircraft.

At night, major taxiways have a centreline lit with green lights, with the edges often lit blue. Taxiways are named by letters of the alphabet. They are intended to follow a logical pattern, such as Taxiway A (Alpha) being the first taxiway onto a runway, followed by B (Bravo) and so on. However, at older airfields this pattern can be disrupted, as years of re-organising and building of new aprons and terminals begin to increase the complexity of the taxiway system. Careful navigation is needed to avoid wrong turns, which at a busy international airport can quickly cause massive disruption.

You can easily determine which taxiway you are on by the signage. A black sign with yellow letters tell you which taxiway you are on right now. Remember: Black Square, You're There.

The opposite of this, a Yellow sign with black lettering, show upcoming taxiways. An arrow is often included at busy intersections to aid orientation.

Many taxiways will have restrictions, such as a maximum wingspan. A wingspan restriction allows you to be confident that while using that taxiway your wings will not strike other aircraft or hazards. Such restrictions will be written in the airport charts for that airfield, with the most significant restrictions often painted on the ground itself.

To help indicate when you are entering a runway and to assist ATC with sequencing the flow of traffic, many taxiways have holding points. These take two forms:

Type A



These holding points are important to spot, as they indicate the last holding point before entering a runway. These should never be crossed without clearance from ATC. Type A holds are directional and can be crossed freely from one direction but must not be crossed without clearance from the other direction. These are usually arranged so that you must await clearance before entering a runway, but you may cross them freely when vacating a runway, to help keep the runway clear.



Type B



These are intermediate holding points and can be used by ATC to help sequence aircraft into the optimal order for takeoff. These holding positions can be crossed unless told otherwise and can be crossed in either direction.

Holding positions are named to match the taxiway on which they are located. For example, taxiway A may have holding positions named A1 or A2.

At airports with the capability for Low Visibility Procedures (LVPs) there will usually be a red stop bar that spans across the holding point, acting in the same way as a red traffic light on the road. Even with ATC clearance, a red stop bar must not be crossed until it is switched off to indicate you may proceed.



An airport can appear as a confusing web of aprons, taxiways, holding points and runways, but there is method in the madness. These markings and lighting are standardised across the globe, with only occasional variations. For example, some runways in Scandinavia have yellow markings, to make them more easily visible in snowy conditions, which occur regularly. Many runways in the UK have a slightly different touchdown zone marking, again to aid visibility, helping it to stand out on a heavily used runway with thick rubber deposits.

APPROACH LIGHTING

As with runways and taxiways, providing lighting to the approach path will greatly improve visibility and allow far easier visual guidance towards a safe and accurate landing.



Often influenced by the local terrain and landing capabilities available, approach lights take many forms. although they are largely standardised, a great variation of lighting patterns can be found worldwide. Approach lighting is there to help you visually acquire the runway and its surroundings. This is most apparent at night, where they provide great assistance with judging distance to go, approach slope and even offers an equivalent horizon to aid keeping wings level. In addition to night lighting, approach lights come into their own in low visibility, where thick fog can mean the runway would otherwise not be sighted until just a second or two before touchdown. This would not give enough time for the captain to successfully verify that the approach has correctly led the aircraft to the landing zone.

To give the pilot much more time, approach lights stretch out from the runway and will be the very first indication that the pilot can receive to judge the progress of their approach. Having this increased safety margin allows for landings in thicker fog than would otherwise be possible.

METAR REPORTS

Rain or shine, a pilot needs to know the weather of the departure airfield, enroute and at the destination. The exact details of temperature, cloud base, wind speeds etc need to be communicated quickly and clearly in a standardised way. This is done by the use of METARs and TAFs.



The definition of METAR varies slightly between countries, but is generally referring to a Meteorological aerodrome report. A METAR provides a snapshot of the current weather at an airport and is published at regular intervals, generally hourly. They are generated either manually or automatically, depending on the equipment in use at a particular airfield. Automatically compiled METARs begin with “AUTO”.

It is within a METAR that the detailed weather information can be found. Information contained within the message can include:

- Airport
- Date and Time
- Wind direction and speed
- Visibility
- Temperature and dew point
- Cloud type and height
- Precipitation type and intensity
- Air pressure
- Trend of weather changes

That is a lot of information to communicate. Looking at an example METAR will show us how we get so many details into a short message.

EGCC 300520Z AUTO 19004KT 150V230 9999 FEW040CB -SHRA 12/11 Q1001 NOSIG

To understand what information we are seeing, we can break this message down into its components, which we'll run through one by one.

AIRPORT CODE

EGCC

ICAO airport code for Manchester, UK.

IATA Codes

Each airport has its name converted into two types of code. IATA and ICAO. IATA is a 3-letter code that many frequent fliers will already be accustomed to.

Here are some well-known examples:

<i>LAX</i>	Los Angeles
<i>LHR</i>	London Heathrow
<i>JFK</i>	New York John F. Kennedy
<i>SFO</i>	San Francisco

ICAO Codes

Less familiar to the travelling public, ICAO codes are the type used almost exclusively by pilots and ATC.

As a 4-letter code, it contains information about the airport location. The first 1-2 letters help to locate the airfield. Conventions vary by location, but in Europe the airports are divided by upper (E) and lower (L) areas within Europe, followed by the country. The remainder of the code defines the individual airport, occasionally using letters from the airport name, but usually are simply allocated.

A few examples will show the most common conventions:

<i>LFPG</i>	Lower Europe, France, Paris Charles de Gaulle
<i>EGPH</i>	Upper Europe, Great Britain, Edinburgh.
<i>NZHN</i>	New Zealand, Hamilton
<i>EHAM</i>	Upper Europe, Holland (The Netherlands), Amsterdam.

DATE + TIME

300520Z

Day of the month (30) and the time in UTC (0520Z).

A METAR is published typically every hour or half hour, giving regular updates to provide a snapshot of the current weather conditions.

UTC Time

As the earth is a rotating sphere, local time of day at the same instant varies around the globe. To manage this, the earth is generally divided into 25 time zones, named A-Z (Skipping J). Each zone represents an hour difference from UTC (Universal Coordinated Time).

For example, GMT +1 is time zone A, GMT +2 is B, etc. GMT itself is time zone Z or “Zulu” in the phonetic alphabet, giving rise to the convention of Zulu Time or UTC.

J was not used to avoid confusion with letter I, as this was the convention around the 1800s when this system was devised. Occasionally J is used to represent the observer’s own local time, but this is almost always represented as L for Local.

Previously referred to as Greenwich Mean Time (GMT), Universal Co-ordinated Time (UTC) is used throughout the world to avoid confusion and is in regular use in aviation.



OBSERVATION TYPE

AUTO

AUTO indicates that this METAR has been compiled automatically by software, as opposed to by a human observer.

WIND DIRECTION + SPEED

19004KT

This represents the average (mean) wind direction in degrees true (190) and wind speed in knots (04).

Wind direction is rounded to the nearest 10 degrees and indicates to the pilot which direction the wind is coming from. In our case, it is blowing from 190 degrees, which is roughly from the south.

As runways are numbered in degrees magnetic, while METARs give wind in degrees true, care should be taken when working out if you are to expect a headwind or tailwind, or if the crosswind is within your aircraft's limits.

Some airports can be highly disrupted by even moderate winds if they are coming from an inconvenient direction. For example, if an airfield only allows landings in one direction, possibly due to terrain, a tailwind can easily prevent landing. As the commander, you would need to be very aware of this possibility, as it may increase the chance of a diversion dramatically, which needs careful planning.

In other cases, terrain or buildings may cause turbulence when landing, if the wind has to pass by those obstacles before reaching the runway. An example of this could be the hangars just to the south of London Gatwick 26L, where a relatively moderate wind speed, as little as 10-15 knots, can cause considerable turbulence and rolling to an airliner just moments before touchdown. Look upwind to see if any obstacles are near the runway, as this can help you predict these disturbances.

Wind speed in aviation is almost always measured in knots (KTS) meaning nautical miles per hour. Some reports may use Meters per Seconds (MPS), which can be roughly converted into Knots by doubling the figure.

For example, 10 MPS = Approx. 20 KTS.

Degrees True vs Magnetic

To understand what is meant by degrees True, we need to take a quick look at how positions on the earth are described. A location can be described by coordinates, which give a position on the globe as a Latitude and Longitude. Lines of longitude run north south between the poles. This 'Geographic' North pole is different to the Magnetic North pole, which moves from year to year and is where a magnetic compass would lead you to. given in degrees true, meaning degrees from a North which is aligned with the earth's lines of Longitude. The difference between True North and Magnetic North is known as Magnetic Variation. This variation changes from year to year and place to place and can be quite considerable. In the UK, variation is as little as about 2 degrees, whereas in New Zealand it can be as high as 20 degrees.

150V230

Wind direction and speed are not always smooth and constant. Wind direction can vary minute by minute and strong gusts can come and go by the second. This presents increased difficulty in aircraft handling and so are reported. To show that the direction is variable, a V or VRB is used. A V is surrounded by the extremes in direction. So 150V230, as in our example, represents a variable wind between directions of 150 and 230 degrees true.

Often very light winds are described as VRB as they are not strong enough to determine their direction. Speed is reported as an average over a short period, usually the last few minutes.

Gusty conditions can make handling more difficult, as your airspeed, vertical speed and sideways drift can all vary second by second. To indicate the presence and severity of gusts, G can be included in the wind speed.

For example, if the wind was from the south at 15 knots gusting up to 25 knots it could be represented as 18015G25.

VISIBILITY

9999

These numbers represent the visibility from the airport in metres. A figure of 5000 would represent 5km visibility. In clear conditions, of visibility of over 10km, the numbers 9999 are used, sometimes referred to by pilots as “all the nines”.

With relatively good visibility, distances can be estimated by an observer, such as reporting the distance to the furthest visible object.

Visibility can be reduced by many factors, such as rain, mist or smoke. When the visibility is reduced, the cause is often included. For example, if visibility is 5km on a hazy day, this might be reported as 5000 HZ.

Visibility can occasionally be very different in one particular direction. This is reported in the METAR as the visibility in metres followed by the direction, such as “3500NW” representing 3500m to the North West.

Here are some of the causes of reduced visibility, their associated METAR code and what the implications can be.

Mist

BR

Visibility below 5km. Visibility somewhat reduced. Usually unable to depart for a VFR flight as 5km visibility is usually required for VFR. IFR flights generally unaffected.

Fog

FG

Visibility Below 1000m. Greatly impaired visibility. Extra caution and reduced speeds when taxiing. Traffic flow restricted, causing holding and delays. Tends to form or worsen in the early hours, as the rising sun causes heating and mixing. Often dissipates to reveal a clear day, but

can linger for many hours, not helped by the characteristically low wind speeds that accompany fog.

Smoke **FU**

From the French “Fumer”, smoke can cause localised reductions in visibility. Ingested smoke can enter the aircraft cabin via vents or air conditioning, potentially causing alarm amongst passengers or triggering smoke warnings from the aircraft systems. Thick smoke is usually highly visible and avoidable in the daytime, but can be unexpected and invisible at night. Blows downwind and can change direction repeatedly. Usually very localised and of short duration.

Volcanic Ash **VA**

A very serious threat. Ash will clog ports and engine intakes, while causing serious abrasion on the paint and windscreens. A jet aircraft can experience loss of thrust or failure of all engines.

Abrasion and clogging are likely to persist, but a jet engine can recover. The ash comes into contact with the red-hot turbine blades at the rear of the engine, effectively being heated and turned into a glass-like material. These deposits can significantly affect airflow and ruin engine performance. Once cooled, this material has been known to break away and clear, so attempts to restart should continue for as long as possible.

Ash deposits can also fall to the ground and fill the runways and taxiways, closing an airport and taking many hours or days to clear.

Sand **SA**

Masses of airborne sand can cause very severe reductions in visibility and will easily close an airport. In a similar manner to VA, Sand can clog vents, intakes and ports. Use reduced engine power when taxiing and be considerate as to where your thrust will blow the sand.

While the visibility is reduced due to some phenomena such as Smoke or Fog, there is often good reason to include a little extra data to describe how it is distributed at the airfield. Here are some of the codes you may come across:

Partial	PR
Patches	BC
Shallow	MI
Drifting	DR
Blowing	BL

CLOUD

FEW040CB

The density, height and type of cloud is an important factor when considering airfield weather. Density is conventionally described in units called Octas, which generally represent how much of the sky is obscured. Obscuration is rated as a number out of 8 Octas, described in a METAR with the following system:

1-2	Few	FEW
3-4	Scattered	SCT
5-7	Broken	BKN
8	Overcast	OVC

The height of the cloud bottoms is given in hundreds of feet above the airport elevation. Our example gives 040, meaning a height of 4000ft. The height of the cloud is measured as height above the airfield, as opposed to altitude. So, if an airport has an elevation above sea level of 500ft, a reported BKN020 will be encountered at 2500ft indicated altitude.

NCD If the skies appear to be clear to an automatic observing system, NCD (No Cloud Detected) may be included in an AUTO METAR.



Some scattered clouds at 3000ft are unlikely to cause much distress. Conversely, a storm cloud can cause great challenges. Significant cloud is reported as such using the following coding.

Towering Cumulus TCU

A cumulous cloud with great vertical development. Strong air currents are contained within but tend to affect only at very short range. Can be avoided at close distances. Less severe than a CB, but still attempt to avoid. Can cause delays if found on the approach path.

Cumulonimbus CB

A more developed cloud, posing a serious threat to anyone straying too close. A CB contains far harsher conditions than a TCU, and are usually far larger. Air currents are fierce and further reaching, so a wider margin is needed for avoidance. If approaching an airfield with a CB nearby, proceed with great caution and be prepared for windshear.

CAVOK

Stands for Cloud and Visibility OK. This does not necessarily mean clear skies, as it is used if the following conditions are met:

- Visibility 10km or more
- No cloud below 5000ft or the MSA
- No CB or TCU at any height
- No precipitation

PRECIPITATION

-SHRA

Next in our METAR code we'll find any significant conditions, such as precipitation. Its type, frequency and intensity are all coded with a simple system.

Many variations of precipitation can be found all around the world. From hail stones to drizzle, a code is in place to identify the prevailing conditions.

When it comes to rain, everyday experience reminds us that it can take various forms. A shower (SH) means the rain passes quickly, usually followed by more shortly after. Drizzle (DZ) on the other hand can linger for what seems like hours or even days.

The frequency is implied by the type of precipitation. Rain (RA) may be long lasting but Rain Showers (SHRA) may be short lived.

The intensity is assumed to be moderate unless accompanied by - (Light) or + (Heavy). Heavy precipitation of any kind will be worth your attention.

Here is a selection of some of the most common forms that precipitation and weather conditions can take and what it means to you as a pilot.

Showers SH

Can be heavy, but temporary. Usually, more showers are coming but are small and seen easily, making them easier to avoid. Look upwind to see what is coming.

Drizzle DZ

Rarely heavy, fine rain droplets reduce visibility and is unlikely to cease in the immediate future. Can thoroughly drench grass runways and painted markings, making them very slippery. Usually are widespread.

Hail GR

Hail stones can cause significant damage, as passing through them at speed can severely harm propellers, nose cones and windscreens. Often of short duration and located nearby or within Cumulonimbus (CB) Cloud. To be avoided when at all possible.

Freezing Rain FZRA

Rain that freezes to your aircraft on contact, building up rapidly and dangerously. Can clog intakes, disrupt wing airflow and increase aircraft weight at dramatic speed. A rare but severe occurrence.

Heavy Rain +RA

Larger rain droplets in vast quantities. Causes such a great reduction in visibility that windshield wipers are of little help. Runway may be unable to drain water quicker than it falls so standing water or flooding can appear rapidly. Water ingested into engine may reduce performance or cause failure in extreme cases. Aircraft may lose momentum against the wall of water and have reduced thrust. Usually isolated.

Snow SN

Usually light but in continued cold conditions will build up and has potential for huge disruption. Can take hours to clear runways and taxiways, especially if not forecast.

Slippery on the ground, taxi with care. Can be widespread, with alternate airports filling up with diversions quickly.

Cleared snow will be formed into banks near the taxiway, ensure your wings or engines will clear them. A runway does not always need to be cleared completely, so the visible tarmac may be misleading as to the runway's real proportions, causing confusing visual illusions when landing.

If a period of significant weather has ended, but is still worth mentioning, a Recent (RE) code can be incorporated. You may come across codes such as RETS or RERA, indicating that these weather phenomena have ceased, but may have lasting after-effects such as disruption or water patches.

AIR TEMPERATURE

12/10

The air temperature and dew point are presented together, to give the outside temperature and humidity. Measured in Centigrade, the temperature can have profound effects on the aircraft performance and operation. On hot days with strong sunshine, dark surfaces such as roads and car parks will heat up quickly and will conduct much of that heat into the air directly above, causing an updraft of warm rising air. These narrow columns are called thermals and can be quite destabilising on the approach and landing.

When entering the thermal, the aircraft be carried upwards with the rising air, putting you slightly high and suggesting reduced thrust to descend. Shortly after, when leaving the thermal, you will begin to fall back down as you lose your updraft. As you may have reduced power to regain the glidepath, you will find yourself pulling the nose up to arrest your sink rate and require a boost of thrust to maintain speed. This process may repeat itself several times on a single approach and makes a stable approach more difficult to achieve.

The first figure is the temperature, followed by the dew point. The dew point is a useful figure to consider, as it represents the temperature at which the air will reach 100% humidity. When such a condition exists, the air cannot carry any extra moisture, causing mist or fog.



On hot days, aircraft tend to have decreased performance, as the warm air is less dense, reducing engine power output. This also occurs in humid conditions, which can be deciphered in a METAR message as the relationship between the temperature and dew point.

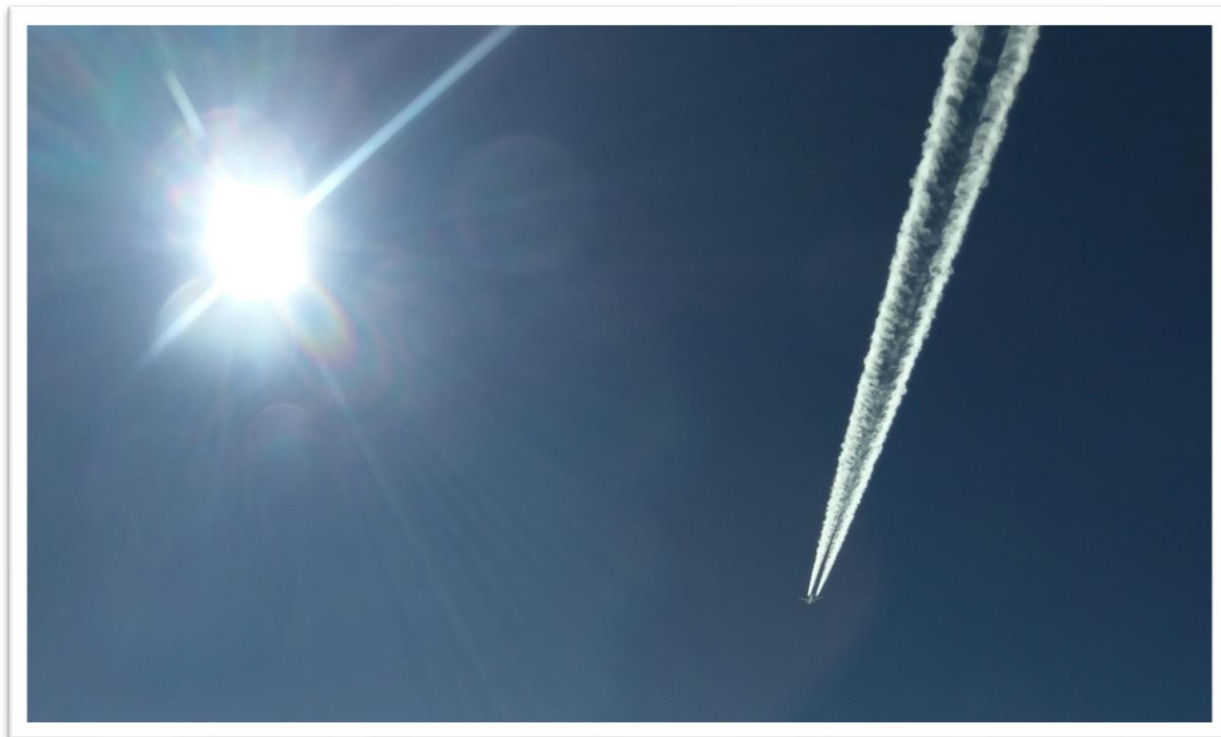
For instance, if 10/10 is reported, the air is fully saturated, indicating high humidity, the possibility of fog and reduced performance.

AIR PRESSURE

Q1020

The local reported QNH is listed with 4 digits and a leading Q. An Altimeter setting, as used in the USA, has a leading A. EG A2992 signifies 29.92 InHg.

Refer to the section on Altimetry for more information about QNH and altimeters.



TREND

NOSIG

If No Significant change in weather for the next 2 hours is forecast, the code NOSIG may be included at the end of the METAR. If there are changes on the way, there are the following codes to indicate this to the pilot.

Becoming **BECMG**

This code is used for a relatively long-term trend in the weather, generally lasting no more than 2 hours, but can on occasion apply up to 4 hours.

Temporary **TEMPO**

For a more fleeting change, TEMPO is used, indicating a short-term variation in the prevailing conditions, but only for short periods of up to 1 hour.

When more detail is known about the weather in question, more information can be included, such as the times from (FM) or time until (TL) the change will be commencing and ceasing.

WEATHER FORECASTS

A METAR message shows a current snapshot of the conditions at an airfield. But this only reveals part of the story. A forecast is needed to build a more complete picture. In aviation, this is achieved through Terminal Aerodrome Forecasts, known as TAFs.

The coding is very similar to a METAR, but offers a little less detail in exchange for a far wider time range. Here is an example:

```
TAF LFRB 261100Z  
2612/2712 20004KT 9999 SCT030 TX25/2615Z TN14/2706Z  
PROB30  
TEMPO 2703/2708 0600 FG
```

We can already find many of the coding conventions already discussed, but we see a slightly different layout for a TAF. We'll decode this TAF and discover the useful information contained within.

Airport Code LFRB

A forecast is identified as such by beginning with TAF and the aerodrome to which it applies. In this case, Brest in Northern France (LFRB).

Date & Time 261100Z

Our example was published on the 26th day of the month at 1100Z.

A forecast is published at intervals which are determined in accordance with its validity period. A TAF that forecasts a period between of 12 hours or less (to a minimum of 6 hours) will be published every 3 hours. Whereas a TAF with a longer validity period, up to 30 hours, will be published every 6 hours.

Weather 20004KT 9999 SCT030

As with our METAR, we can decode this as a wind of 200/4, visibility of 10KM or more and Scattered clouds at 3000ft AAL.



FORECAST PERIOD

2612/2712

A forecast is designed to cover a specified period of time. This XXXX/XXXX format includes the beginning (26th Day at 1200Z) and the end of this period (27th Day at 1200Z), separated by a “/”.

TEMPERATURE RANGE

TX25/2615Z TN14/2706Z

A system unique to a TAF message is the maximum and minimum temperatures for a period.

Here we see that the highest temperature (TX) of 25C will be reached at 1500Z on the 26th, followed by the lowest temperature (TN) of 14C the following day at 0600Z.

This can be a useful early indication of temperature extremes in summer and winter, where very high or very low temperatures require special handling and care.

PROBABILITY

PROB30

Accurately forecasting the weather for a particular location can be a massive undertaking. With the use of highly sophisticated weather theories and running computer algorithms, we can obtain a very good indication of the likely conditions to come. However, in the real world, things don't always go as expected. There is still an element of guesswork and estimation, with even a tiny misforecast in wind speed, temperature or any number of variables giving rise to a very different result. To help cope with such circumstances, a PROB code can be used to indicate the Probability that a particular set of conditions will occur.

Usually published as either PROB30 or PROB40, this code gives an indication of the probability percentage for a particular condition. In our Brest TAF we see that there is a 30% chance of the following TEMPO condition occurring.

TEMPORARY CONDITIONS

TEMPO 2703/2708 0600 FG

Rated as a 30% chance by the preceding PROB30, This TEMPO indicates that for a time of less than an hour the visibility is forecast to be 600m in Fog.

EXAMPLES

KJFK 161751Z 33009KT 10SM FEW050 26/06 A3025

New York JFK, 26th day at 1751Z, Wind 330/9 knots, 10 Statute Miles visibility (USA often uses Miles rather than KM) Few clouds at 5000ft, temperature 26C dew point 6C, indicating low humidity. Altimeter setting 30.25 in Hg.

NZSP 030912Z 12010KT 4800 IC BR FEW120 M70/ A2767

The South Pole, 3rd day at 0912Z. Wind 120/10 knots, visibility 4800m with Ice Crystals and Mist. Few clouds at 12000 feet, temperature Minus 70C, dew point not reported. Altimeter 27.67 in Hg.

GCXO 021800 30009KT 4500 2000NW PRFG FEW000 SCT007 19/18 Q1018 NOSIG

Tenerife North, 2nd day at 1800Z. Wind 300/9 knots, visibility 4500m except to the North West where it is only 2000m. Partial Fog. Clouds just over the ground, QNH 1018, not expected to change within the next 2hrs.

KLAX 021513Z 0215/0318 VRB03KT P6SM SCT030

FM022000 26012KT P6SM SKC

Los Angeles, 2nd day at 1513Z.

Between 1500Z on the 2nd and 1800Z on the 3rd, wind light and variable. Visibility 6 statute miles. Cloud scattered 3000ft. From 2000Z on the 2nd, wind 260/12, sky clear.

EGLL 081051Z 0812/0818 27014KT 9999

SCT035 PROB40 TEMPO

0812/0814 28018G28KT 7000 RA

London Heathrow, 8th day published at 1051Z. Between 1200-1800Z, westerly wind at 14kts, visibility 10km or more, scattered cloud. 40% chance of temporary gusts up to 28kts between 1200-1400Z with moderate rain and 7km visibility.

OMDB 021343Z 0213/0218 30012KT

PROB30 0223/0301 1500 BR

PROB30 0301/0305 0150 FG VV///

Dubai, 2nd day, published 1343Z.

30% chance of 1500m in mist, possibly worsening at 0100Z to 150m in fog. Vertical visibility not reported.

HAZARDOUS WEATHER

A Thunderstorm is a vicious package of some of the worst weather conditions. Thunderstorms can take all shapes and sizes, but all will have a dangerous combination of weather phenomena, including:

- Turbulence
- Icing
- Lightning
- Heavy Rain
- Hail
- Strong Wind
- Low Pressure

We'll look at each of these adverse weather conditions and some of the risks they can present.



TURBULENCE

Most flights will encounter at least some air turbulence, as this is a very common occurrence and is completely normal.

However, a thunderstorm can cause very severe levels of turbulence, with strong updrafts within the cloud fighting against the strong downdrafts outside of it. Turbulence is not confined to within the storm cloud, and can reach as much as 20 miles from the storm itself.

Light turbulence is of little interest other than slight discomfort, but severe turbulence can cause injuries to those onboard and can damage the aircraft structure and is something that must be avoided.

ICING

In a storm, water can become what is called 'supercooled'. This is water that is colder than the freezing point, but remains liquid until impact with a surface, such as your aircraft. This can cause serious problems. Severe icing will cause multiple problems. It will disturb the airflow over the wings, increase your weight, reduce engine performance and can interfere with the controls.



Many aircraft have anti-icing or de-icing systems built in, but these are often no match for the severe ice encountered in a thunderstorm.

LIGHTNING

Lightning is one of the most visible hazards of a thunderstorm and can cause damage to aircraft structures and equipment.

A very loud bang will be heard and you may encounter system failures, especially electronic equipment.

After a strike occurs, check your systems straight away to see if anything has been damaged.

The bright flash can cause momentary flash blindness. At night, consider turning up the cockpit lighting, as this will make things easier to see while your eyes readjust after the lightning flash.

HEAVY RAIN

A thunderstorm very often has heavy rain underneath. Such a large amount of water can cause issues for aircraft. The rain will increase the weight of the aircraft slightly, increase your drag and reduce engine power. In a similar way to icing, this can put you into an uncomfortable situation, coupled with a slippery and potentially flooding runway.

Turbofan aircraft can take a lot of water through the intake before they start to choke, as the fan blades centrifuge the water to around and past the engine core. However, a piston aircraft can run into trouble more easily. With enough water, you can experience hydro locking, where the incompressible water is squeezed by the pistons and damages the engine cylinders. Jet powered or not, heavy rain is very hazardous to aircraft.

HAIL

Hailstones tend to fall from under the anvil of a storm cloud. At high airspeeds, these pellets can cause a surprising amount of damage to nose cones and even smashing windscreens or chipping at propellers, racking up expensive repairs. Flying under the anvil of a storm cloud is always to be avoided.



STRONG WINDS

While you can have severe turbulence in and around a thunderstorm, winds can reach very high speeds, causing damage to objects on the ground and raising handling difficulties in the air. A nearby storm could cause the crosswind to exceed the maximum allowed for your aircraft, often requiring a diversion. The wind can change significantly and very rapidly, with strong gusts, headwinds changing to tailwinds and producing unpredictable conditions. With strong winds, buildings and terrain near the runway can cause turbulence low to the ground, so you'll have to stay on your toes.

LOW PRESSURE

Altimeters are basically pressure gauges. As we climb, the air pressure reduces, which the altimeter is calibrated to convert into altitude.

A storm is usually part of a low-pressure system and can have rapid pressure reductions without notice. The hazard comes when the pressure drops, the altimeter interprets this as a climb and will over-read. You may then have to descend slightly to maintain a cleared altitude. This means you have had to descend to maintain an indicated altitude, meaning your height, which is your actual distance from the ground, has reduced, putting you lower than you would normally be.

To remember this, we can say High to Low, lookout below. Meaning if we fly to lower pressure, we are closer to the terrain.



SUMMARY

In summary, there are a multitude of hazards accompanying a thunderstorm and they are to always be avoided when at all possible. If near to the airport as you are departing, it would be wise to delay takeoff until it has passed. If they are forecast at your destination, you'll want an alternate airport ready and waiting, in case of a diversion.

WHERE NEXT?

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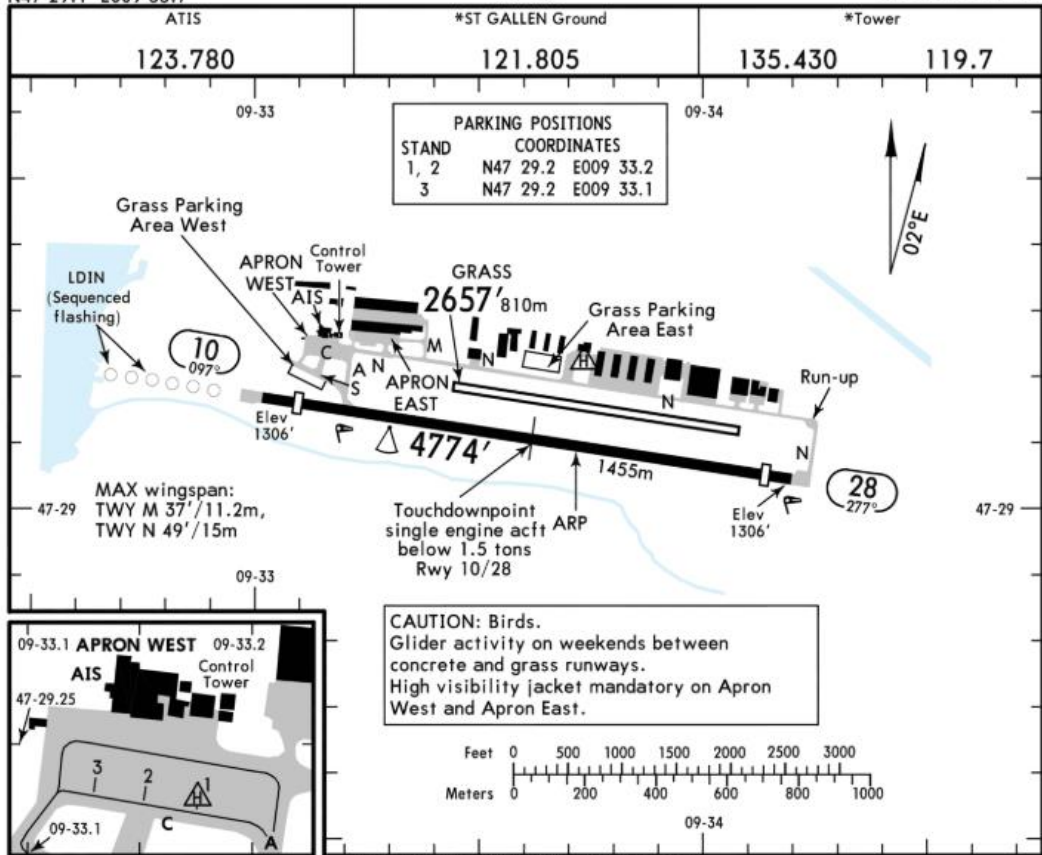
AIRFIELD CHARTS

The in-game navlog contains the airfield charts for each arrival airport that has published charts. They are reproduced in the following pages for your convenience, in order of appearance.

Charts ©Jeppesen 2020 and available via Navigraph. For simulation use.

LSZR/ACH
 Apt Elev 1306'
 N47 29.1 E009 33.7

JEPPESEN ST GALLEN, SWITZERLAND
 14 AUG 20 (10-9)
 ALTENRHEIN



ADDITIONAL RUNWAY INFORMATION

RWY		USABLE LENGTHS			WIDTH
		Threshold	Landing Beyond	TAKE-OFF	
10	HIRL (50m) Simple TDZ LDIN REIL PAPI ② RVR	4528' ③ 1380m	3806' 1160m		98'
28	HIRL (50m) Simple TDZ PAPI-L (angle 4.0°)	4593' ③ 1400m			30m
10	Grass runway				66'
28					20m

- ① Rwy grooved. ② (4.0°, MEHT 23') ③ Single engine aircraft: 2352' (717m).
- ④ Single engine aircraft: 2421' (738m).

NOISE ABATEMENT PROCEDURE

Reverse thrust

For deceleration it is recommended to use entire rwy length available. Reverse thrust shall be used for safety or operational reasons only.

Taxi and holding

Acraft shall be operated with minimum noise level on the ground.

Meteo condition

If Meteo condition permits expect Rwy 10 for landing and Rwy 28 for departure.

	TAKE-OFF	
	Main Rwy	
A	Day: RL or RCLM Night: RL	Adequate vis ref (Day only)
B	400m	800m
C		
D	NOT APPLICABLE	

CHANGES: Wingspan restrictions.

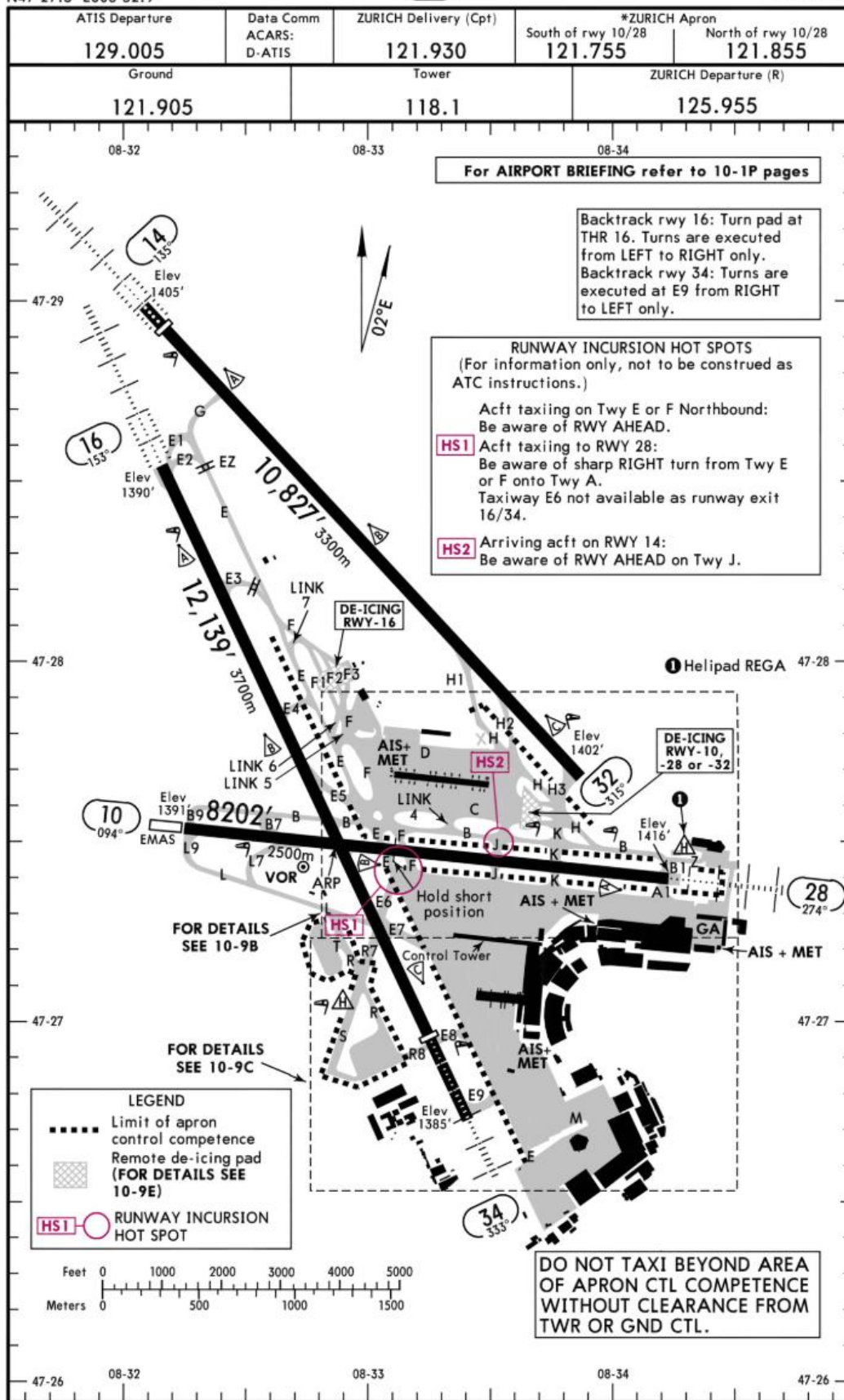
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NAVIGRAPH CHARTS INTENDED FOR FLIGHT SIMULATION ONLY - NOT FOR NAVIGATIONAL USE

LSZH/ZRH
 Apt Elev 1417'
 N47 27.5 E008 32.9

JEPPESEN
 28 JUN 19 (10-9)

ZURICH, SWITZERLAND
 ZURICH



CHANGES: None.

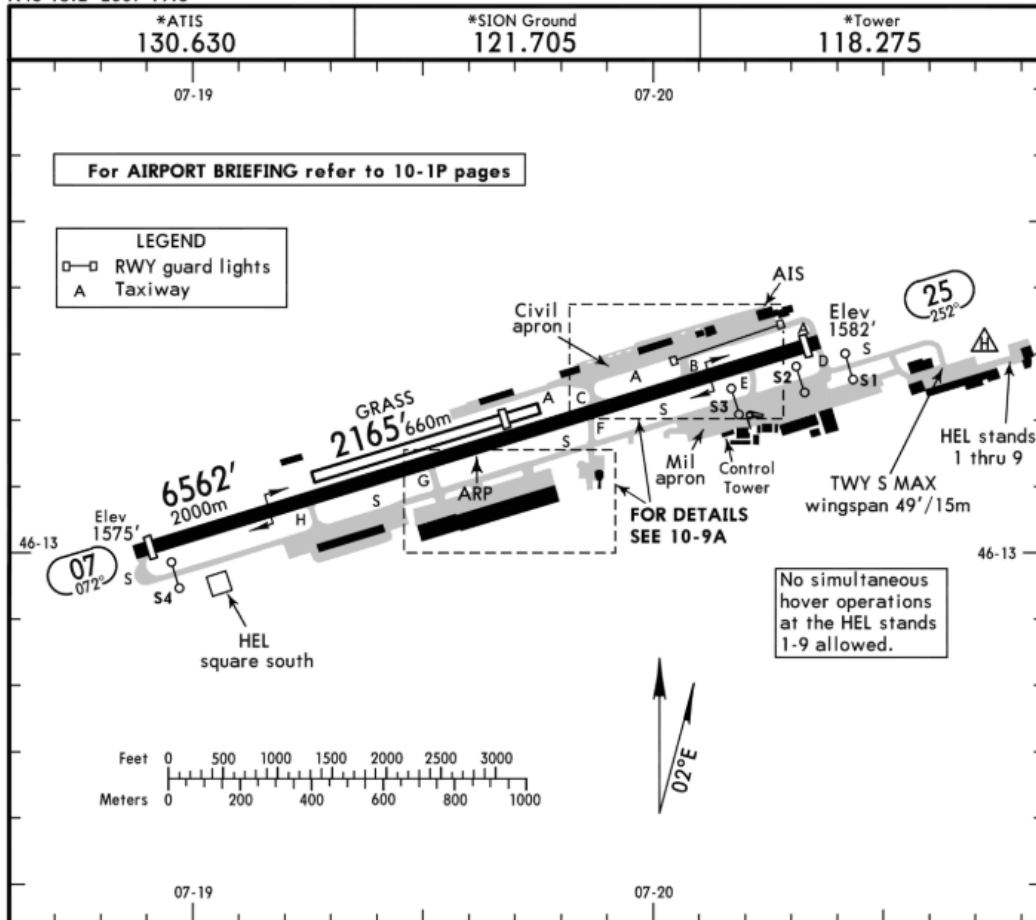
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NAVIGRAPH CHARTS INTENDED FOR FLIGHT SIMULATION ONLY - NOT FOR NAVIGATIONAL USE

LSGS/SIR
Apt Elev 1582'
N46 13.2 E007 19.6

JEPPESEN
8 MAY 20 (10-9) Eff 21 May

SION, SWITZERLAND
SION



ADDITIONAL RUNWAY INFORMATION

RWY		USABLE LENGTHS		TAKE-OFF	WIDTH
		Threshold	Landing Beyond Glide Slope		
07	HIRL (50m) ① HIALS ②③ PAPI-L (angle 4.0°)	6348' 1935m		⑤	131' 40m
25	HIRL (50m) ① HIALS ②④ PAPI-L (angle 4.0°)	6365' 1940m			
07	Grass runway			1837' 560m	98' 30m
25					

Arresting cables not to be taxied over.

① Configuration unknown. ② Additional PAPI-L in front of rwy for Mil use only.

③ PAPI 07 light beam is offset 2° south from runway axis. CAUTION: ICAO obstacle protection surface and PAPI light beam are penetrated by topography starting west of Chamoson village (D3.8 ISI).

④ PAPI 25 light beam is offset 5° north from runway axis. CAUTION: ICAO obstacle protection surface and PAPI light beam are penetrated by topography starting east of Bramois village (D4.0 ISI).

⑤ TAKE-OFF RUN AVAILABLE

RWY 07:

from rwy head 6562' (2000m)
twy H int 4921' (1500m)
twy G int 3773' (1150m)

RWY 25:

from rwy head 6562' (2000m)
twy E int 5906' (1800m)
twy B int 5331' (1625m)
twy C int 4446' (1355m)
twy F int 3464' (1330m)

Standard

TAKE-OFF

	RCLM (DAY only) or RL	NIL (DAY only)
A		
B	6500' - 5.0 km	
C		
D	NOT APPLICABLE	

CHANGES: Usable lengths.

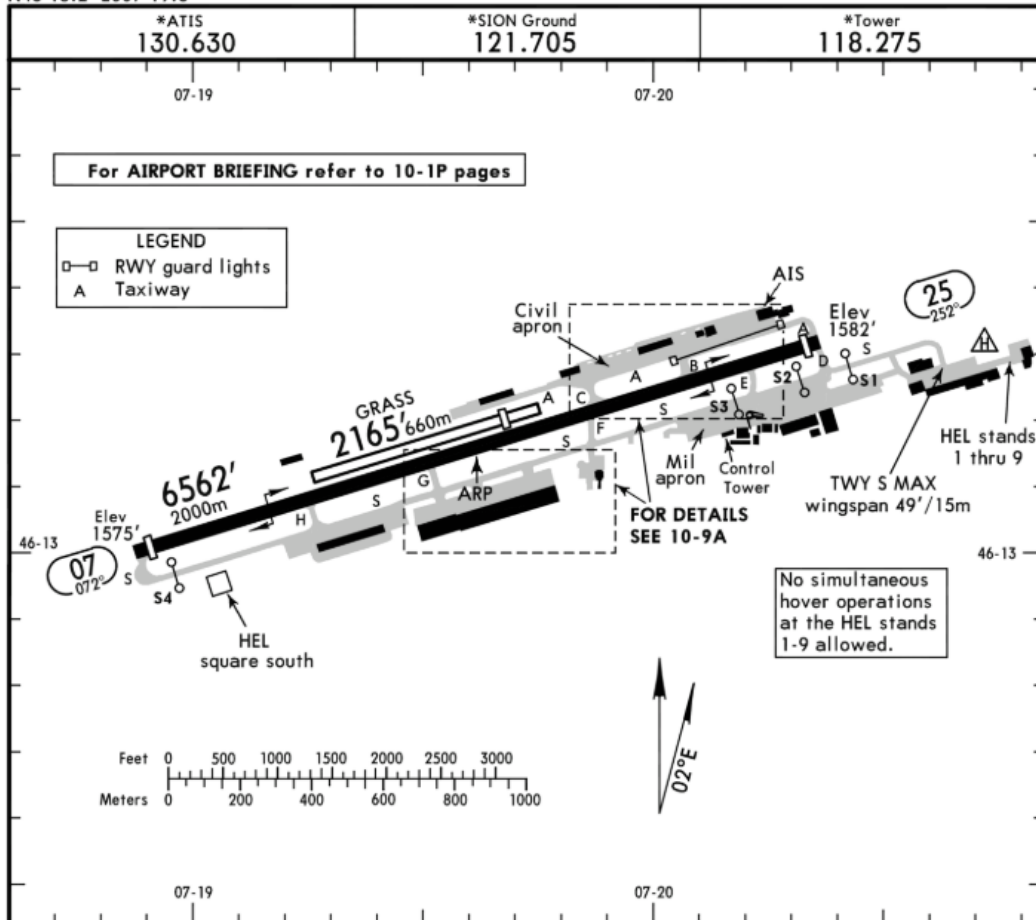
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NAVIGRAPH CHARTS INTENDED FOR FLIGHT SIMULATION ONLY - NOT FOR NAVIGATIONAL USE

LSGS/SIR
Apt Elev 1582'
N46 13.2 E007 19.6

JEPPESEN
8 MAY 20 (10-9) Eff 21 May

SION, SWITZERLAND
SION



ADDITIONAL RUNWAY INFORMATION

RWY	HIRL (50m)	HIALS	PAPI-L (angle 4.0°)	USABLE LENGTHS		TAKE-OFF	WIDTH
				Threshold	Glide Slope		
07		①	②③	6348' 1935m		⑤	131' 40m
25		①	②④	6365' 1940m			
07						1837' 560m	98' 30m
25				1837' 560m			

Arresting cables not to be taxied over.

① Configuration unknown. ② Additional PAPI-L in front of rwy for Mil use only.

③ PAPI 07 light beam is offset 2° south from runway axis. CAUTION: ICAO obstacle protection surface and PAPI light beam are penetrated by topography starting west of Chamoson village (D3.8 ISI).

④ PAPI 25 light beam is offset 5° north from runway axis. CAUTION: ICAO obstacle protection surface and PAPI light beam are penetrated by topography starting east of Bramois village (D4.0 ISI).

⑤ TAKE-OFF RUN AVAILABLE

RWY 07:

from rwy head 6562' (2000m)
 twy H int 4921' (1500m)
 twy G int 3773' (1150m)

RWY 25:

from rwy head 6562' (2000m)
 twy E int 5906' (1800m)
 twy B int 5331' (1625m)
 twy C int 4446' (1355m)
 twy F int 3464' (1330m)

Standard

TAKE-OFF

	RCLM (DAY only) or RL	NIL (DAY only)
A		
B	6500' - 5.0 km	
C		
D	NOT APPLICABLE	

CHANGES: Usable lengths.

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NAVIGRAPH CHARTS INTENDED FOR FLIGHT SIMULATION ONLY - NOT FOR NAVIGATIONAL USE

LFLG

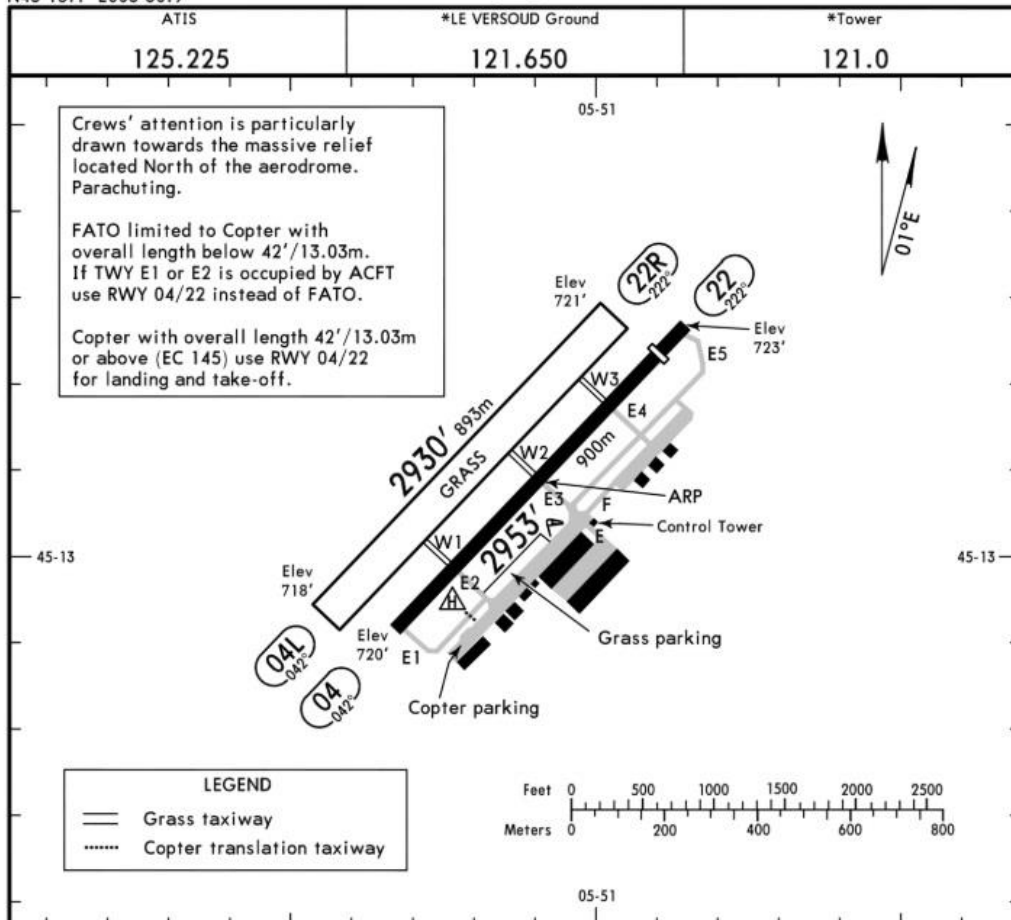
Apt Elev **724'**
N45 13.1 E005 50.9

JEPPESEN

15 MAY 20 **(20-9)** Eff 21 May

GRENOBLE, FRANCE

LE VERSOUD



ADDITIONAL RUNWAY INFORMATION					
RWY		USABLE LENGTHS		TAKE-OFF	WIDTH
		Threshold	Glide Slope		
04	PAPI-L (angle 3.0°) ①				98' 30m
22		2674'	815m		
04L	Grass runway				262' 80m
22R					

① Not usable outside ATS hr.

NOISE ABATEMENT PROCEDURE

- Take-off must start from RWY ends.
- Take-off RWY 04:
At DER climb on 036°. Report over yellow silos passing the Isere river (1 NM), then turn onto heading 042°.
- Take-off RWY 22:
Climb on 242° until overflying the road (0.5 NM), then follow 222°.
- Avoid overflying towns located on the RIGHT side of the Isere river, the downwind leg shall not go beyond the motorway.
- CAUTION: in order to not to interfere with departure trajectories from RWY 04/22 all departures from RWY 04L/22R have to change heading after take-off.

Standard TAKE-OFF				
Low Visibility Take-off				
RL/FATO LTS, RCLM & RVR info	RL/FATO LTS & RCLM	Unlit/unmarked, defined RWY/FATO	Nil Facilities DAY	Nil Facilities NIGHT
VMC				

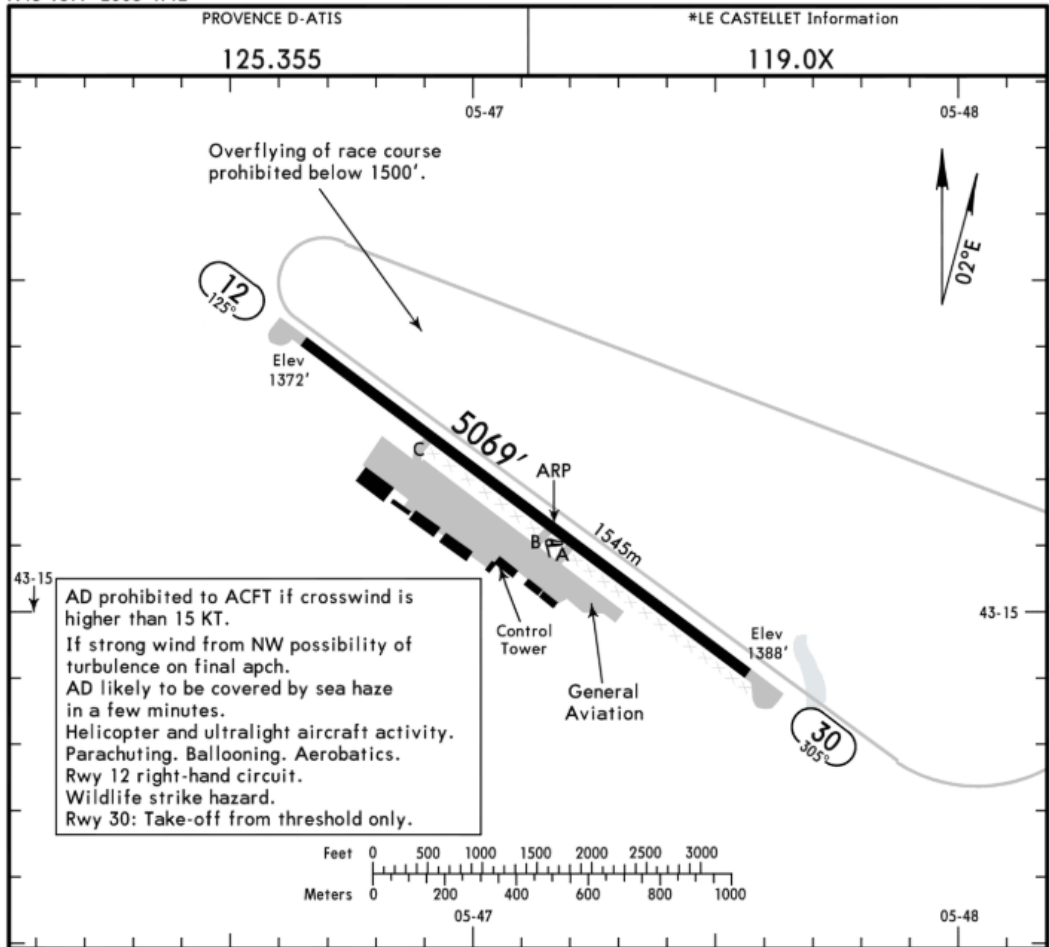
CHANGES: Grass rwy 04/22 redesignated 04L/22R. GND callsign. Notes.

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NAVIGRAPH CHARTS INTENDED FOR FLIGHT SIMULATION ONLY - NOT FOR NAVIGATIONAL USE

LFMQ/CTT
 Apt Elev 1391'
 N43 15.1 E005 47.2

JEPPESEN LE CASTELLET, FRANCE
 30 OCT 20 (10-9) Eff 5 Nov LE CASTELLET



RWY	USABLE LENGTHS		TAKE-OFF	WIDTH
	Threshold	Landing Beyond		
12	RL (60m)			98'
30	RL (60m)	PAPI-R (angle 3.5°) ① ②		30m

① PAPI 30 in use only during ATS hr.
 ② Use of PAPI compulsory.
PREFERENTIAL RWY SYSTEM: If not directed otherwise and wind speed is less than 2m/sec, use rwy 30.
 By sea breeze (wind from SSW) and in case of uncertainty about wind direction, use rwy 30.
 Rwy 12/30 prohibited outside ATS hr, except based helicopters.

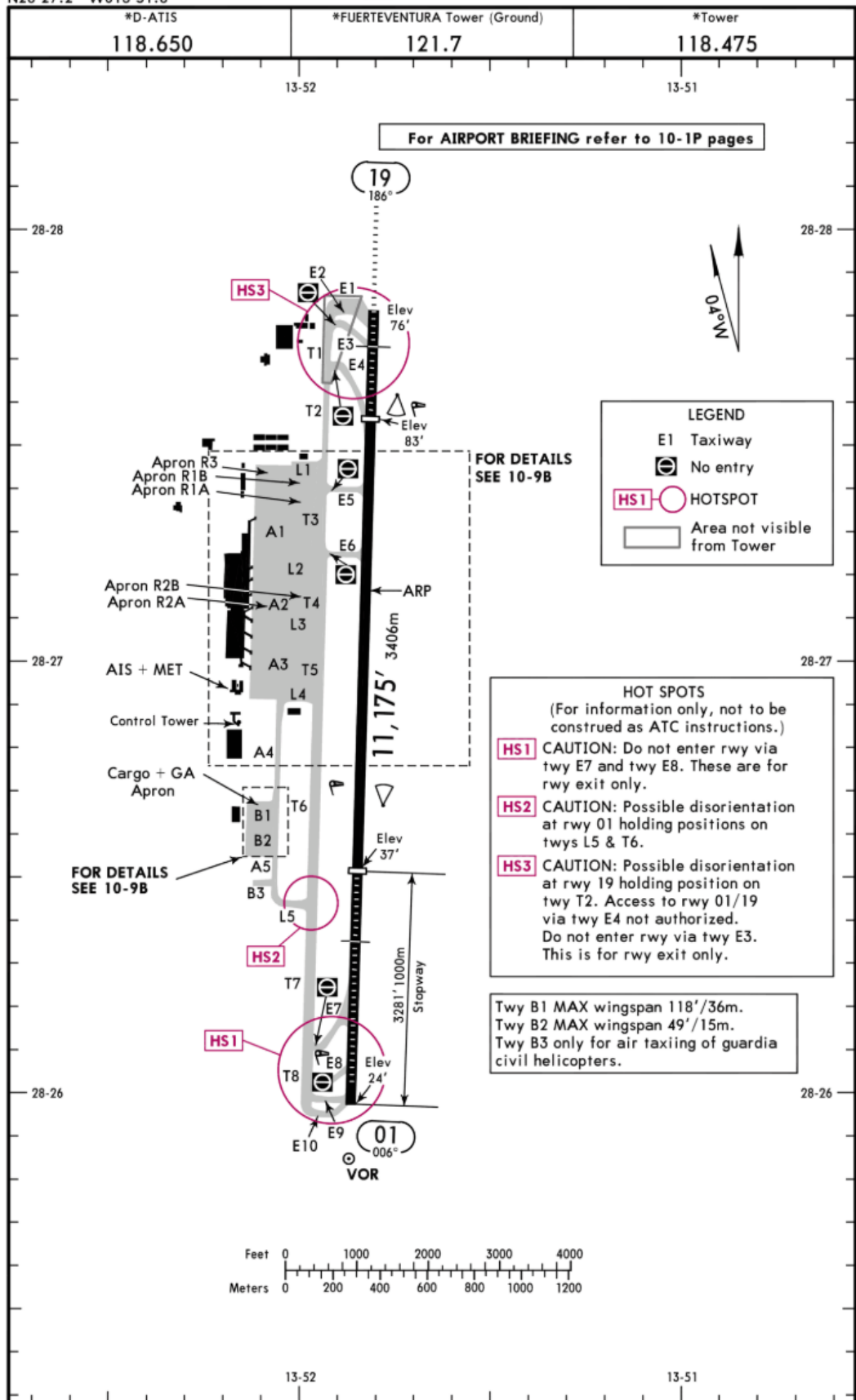
Standard	TAKE-OFF
A	
B	1500m ①
C	
D	NOT APPLICABLE

① Caution advised due to high terrain North of airport.

CHANGES: RWY designations. © JEPPESEN, 2003, 2020. ALL RIGHTS RESERVED.
NAVIGRAPH CHARTS INTENDED FOR FLIGHT SIMULATION ONLY - NOT FOR NAVIGATIONAL USE

GCFV/FUE
 Apt Elev 83'
 N28 27.2 W013 51.8

JEPPESEN FUERTEVENTURA, CANARY IS
 28 AUG 20 **10-9** Eff 10 Sep
 FUERTEVENTURA



FOR DETAILS SEE 10-9B

FOR DETAILS SEE 10-9B

LEGEND

- E1 Taxiway
- ⊘ No entry
- HS1-⊘ HOTSPOT
- Area not visible from Tower

HOT SPOTS
 (For information only, not to be construed as ATC instructions.)

- HS1** CAUTION: Do not enter rwy via twy E7 and twy E8. These are for rwy exit only.
- HS2** CAUTION: Possible disorientation at rwy 01 holding positions on twys L5 & T6.
- HS3** CAUTION: Possible disorientation at rwy 19 holding position on twy T2. Access to rwy 01/19 via twy E4 not authorized. Do not enter rwy via twy E3. This is for rwy exit only.

Twy B1 MAX wingspan 118'/36m.
 Twy B2 MAX wingspan 49'/15m.
 Twy B3 only for air taxiing of guardia civil helicopters.

CHANGES: None.

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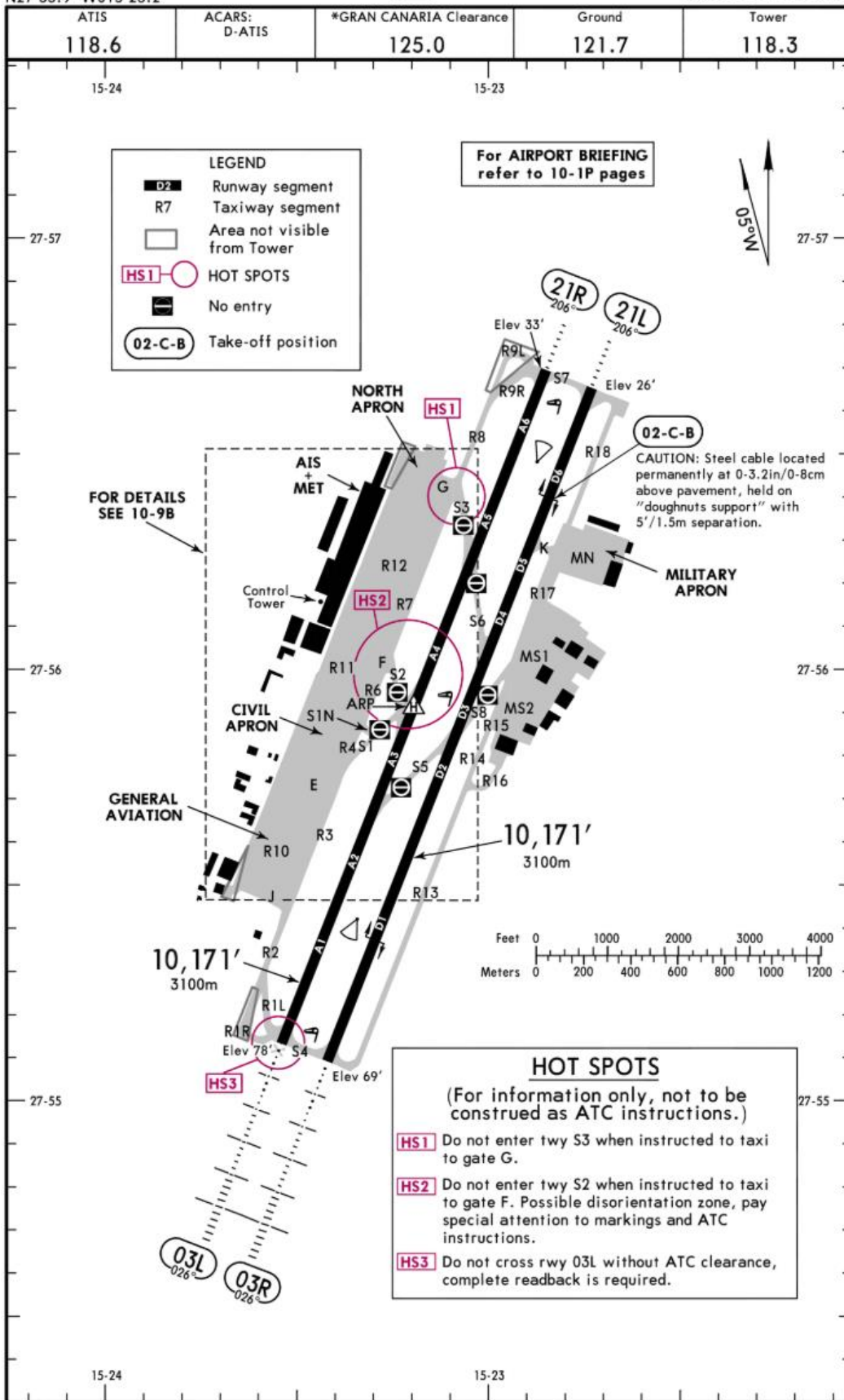
GCLP/LPA

Apt Elev 78'
N27 55.9 W015 23.2

JEPPESEN GRAN CANARIA, CANARY IS

3 AUG 18 (10-9) Eff 16 Aug

GRAN CANARIA



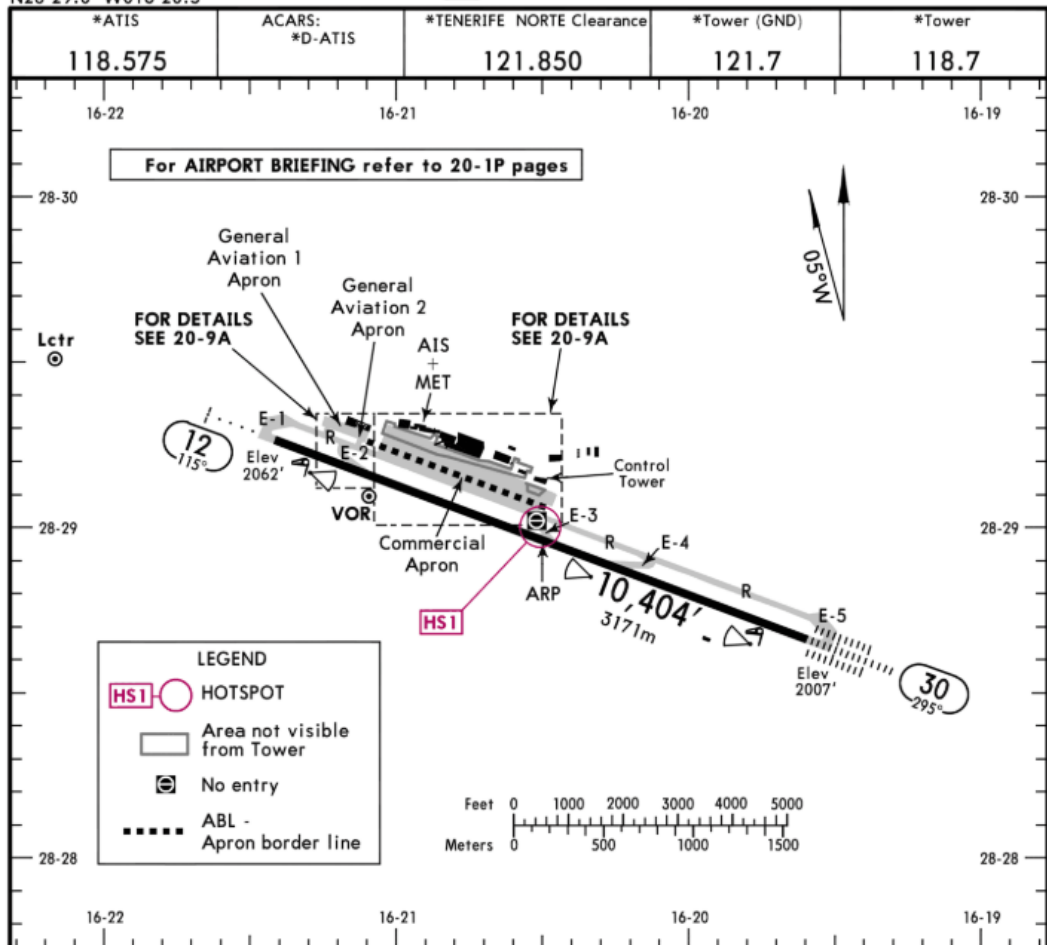
CHANGES: Hotspot withdrawn. RVR Rwy 21R/L added.

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NAVIGRAPH CHARTS INTENDED FOR FLIGHT SIMULATION ONLY - NOT FOR NAVIGATIONAL USE

GCXO/TFN
 Apt Elev **2077'**
 N28 29.0 W016 20.5

JEPPESEN TENERIFE-NORTH, CANARY IS
 2 OCT 20 **(20-9) Eff 8 Oct**
 CIUDAD DE LA LAGUNA



RWY	ADDITIONAL RUNWAY INFORMATION			
	USABLE LENGTHS		TAKE-OFF	WIDTH
	Threshold	Landing Beyond		
12	HIRL(50m) CL(15m) HIALS	RVR	9432' 2875m	148'
30	HIRL(50m) CL(15m) HIALS-II TDZ	RVR	9500' 2896m	45m

① PAPI (3.0°): Not usable by ACFT of code letter E.

② TAKE-OFF RUN AVAILABLE

RWY 12:

From rwy head 10,404' (3171m)
 twy E-2 int 8353' (2546m)

RWY 30:

From rwy head 10,404' (3171m)
 twy E-4 int 6253' (1906m)

HOT SPOTS

For information only, not to be construed as ATC instructions.

HSI CAUTION: Incursion area TWY R with ACFT in push-back and taxiing via TWY R. Explicit clearance from ATC is required prior to vacating runway via TWY E-3. Entry to runway via TWY E-3 is not permitted ('No entry' sign). The use of TWY E-3 is not allowed to ACFT with a wingspan larger than 98'/30m.

Std/State		TAKE-OFF						
Low Visibility Take-off			RL or RCLM		RL or CL		Adequate Vis Ref	
HIRL & CL (spacing 15m or less) & relevant RVR	RL & CL & relevant RVR	RL & CL	RL & RCLM	RL or CL	RL or RCLM	RL or CL	DAY	NIGHT
			DAY	NIGHT	DAY	NIGHT	DAY	NIGHT
TDZ R125m Mid R125m Rollout R125m	TDZ R150m Mid R150m Rollout R150m	R200m	R300m		R/V400m		R/V500m	NA

CHANGES: Apt name. Rwy bearings. New AOM concept.

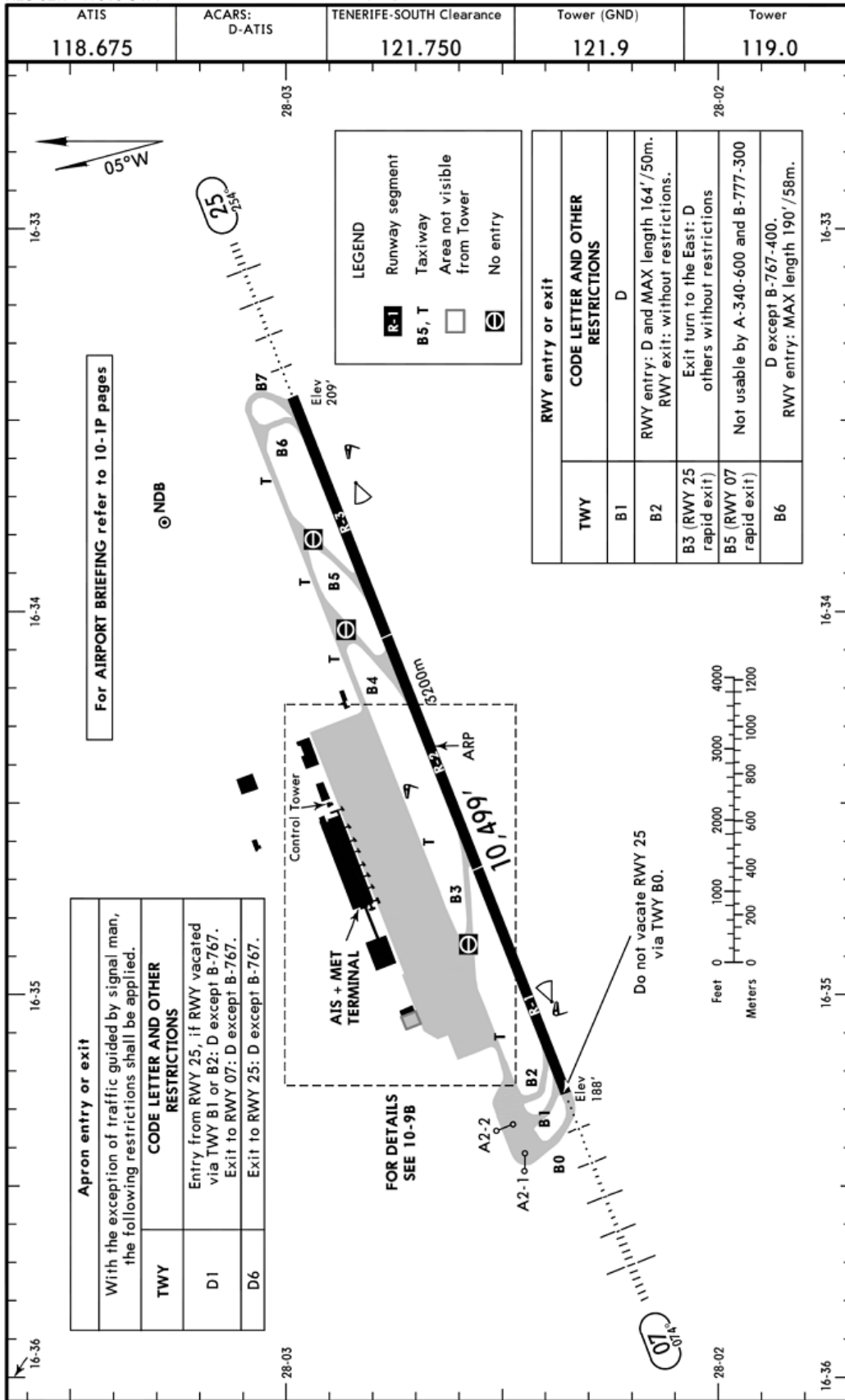
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NAVIGRAPH CHARTS INTENDED FOR FLIGHT SIMULATION ONLY - NOT FOR NAVIGATIONAL USE

GCTS/TFS
 Apt Elev 209'
 N28 02.7 W016 34.4

JEPPESEN TENERIFE-SOUTH, CANARY IS
 31 JUL 20 (10-9) Eff 13 Aug

REINA SOFIA



CHANGES: Apron entry restrictions for TWY D1.

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NAVIGRAPH CHARTS INTENDED FOR FLIGHT SIMULATION ONLY - NOT FOR NAVIGATIONAL USE

GCLA/SPC

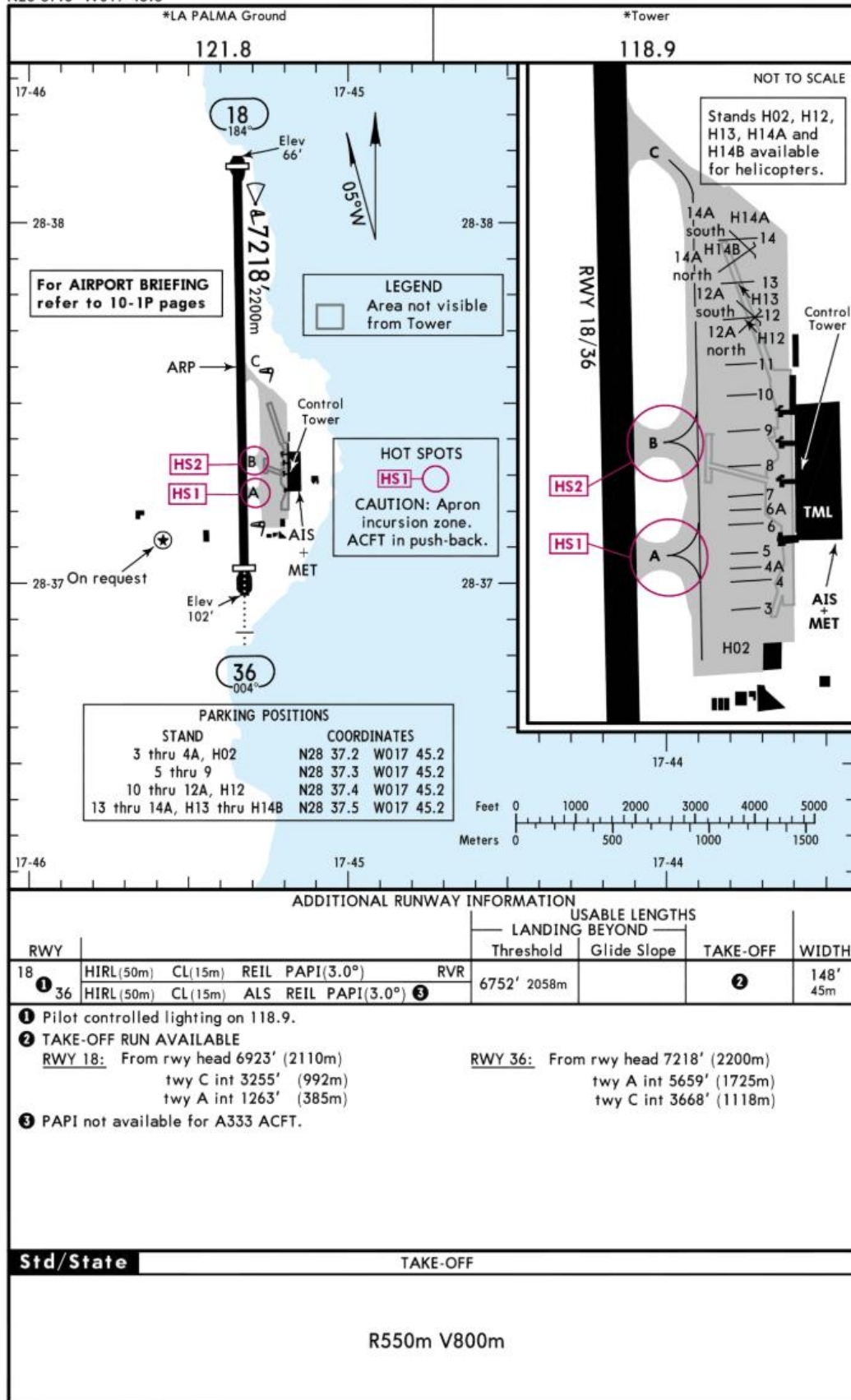
Apt Elev 108'
N28 37.6 W017 45.3

JEPPESEN

LA PALMA, CANARY IS

28 AUG 20 (10-9) Eff 10 Sep

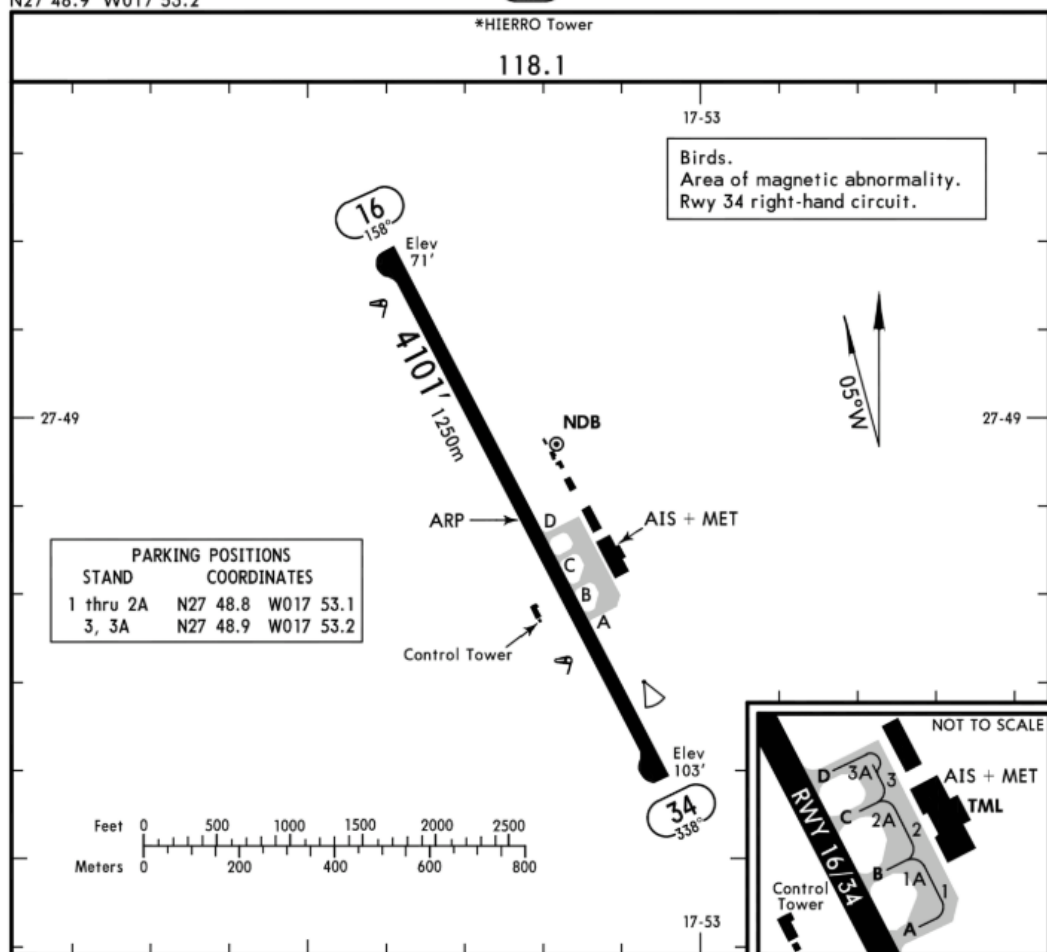
LA PALMA



NAVIGRAPH CHARTS INTENDED FOR FLIGHT SIMULATION ONLY - NOT FOR NAVIGATIONAL USE

GCHI/VDE
 Apt Elev 103'
 N27 48.9 W017 53.2

JEPPESEN EL HIERRO, CANARY IS
 2 OCT 20 (10-9) Eff 8 Oct EL HIERRO



PARKING POSITIONS		
STAND	COORDINATES	
1 thru 2A	N27 48.8	W017 53.1
3, 3A	N27 48.9	W017 53.2

ADDITIONAL RUNWAY INFORMATION

RWY	USABLE LENGTHS				WIDTH
	LANDING BEYOND		TAKE-OFF		
	Threshold	Glide Slope			
16	MIRL (50m)	REIL PAPI (angle 3.0°)			98'
34	MIRL (50m)	REIL PAPI (angle 3.0°)	RVR		30m

- ① Pilot controlled lighting activated on 118.1.
- ② Restricted angular coverage to 4.8° RIGHT side of rwy centerline.

WIND PHENOMENA

On many occasions, wind is oscillating in direction, often within the first quadrant. It is recommended to not approach when the direction of hillside wind is between 280° and 320° and its intensity is above 10 KT, due to very strong mountain wave. With winds between 330° and 350° and intensities above 15 KT, if moderate turbulence on short final, missed approach must be made, because tail wind may be encountered at 50' AGL. In summer, with winds from 020° to 060° and intensities between 20 and 30 KT or more, there will be strong downdrafts at THR 34. With the above mentioned wind phenomena, strong turbulence should be expected after take-off. Therefore it is recommended to turn as soon as possible towards the sea.

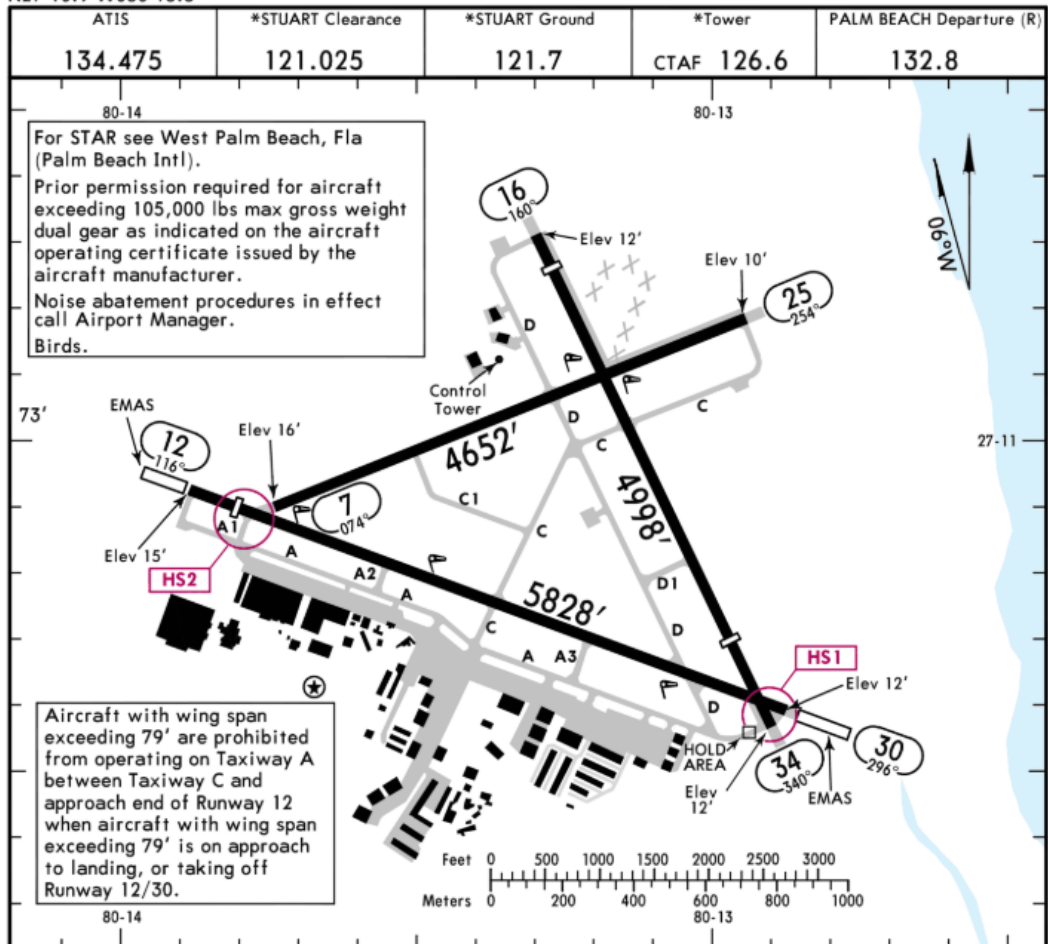
Standard		TAKE-OFF	
	RCLM (Day only)		Adequate vis ref (Day only)
A	400m		500m
B			
C	NOT APPLICABLE		
D			

CHANGES: Location name. Airport name. © JEPPESEN, 1999, 2020. ALL RIGHTS RESERVED. NAVIGRAPH CHARTS INTENDED FOR FLIGHT SIMULATION ONLY - NOT FOR NAVIGATIONAL USE

KSUA/SUA
 Apt Elev 16'
 N27 10.9 W080 13.3

JEPPESEN
 22 FEB 19 (10-9) Eff 28 Feb

STUART, FLA
 WITHAM



Aircraft with wing span exceeding 79' are prohibited from operating on Taxiway A between Taxiway C and approach end of Runway 12 when aircraft with wing span exceeding 79' is on approach to landing, or taking off Runway 12/30.

ADDITIONAL RUNWAY INFORMATION

RWY	USABLE LENGTHS	LANDING BEYOND	TAKE-OFF	WIDTH
7 25	① MIRL ② PAPI-L (angle 3.00°)	grooved		100'
12 30	① MIRL ① REIL PAPI-L (angle 3.00°)	grooved	5368'	100'
16 34			4662' 4118'	100'

- ① Activate on 126.6 after 2200 LT.
- ② Restricted to 7.5 NM West of Rwy 25 due to 1548' MSL towers within 10° of extended centerline.

RUNWAY INCURSION HOT SPOTS

For information only, not to be construed as ATC instructions.

- HS1** Intersecting Rwys, Wrong Runway Departure Risk (Check Rwy Alignment)
- HS2** Rwy 12 and Twy A1

TAKE-OFF & OBSTACLE DEPARTURE PROCEDURE		FOR FILING AS ALTERNATE	
All Rwys		Authorized Only When Local Weather Available	
Adequate Vis Ref		RNAV (GPS) Rwy 12	
STD		RNAV (GPS) Rwy 30	
1 & 2 Eng	1	A	800-2
3 & 4 Eng	1/2	B	800-2
		C	
		D	

OBSTACLE DP:
 Rwy 25: Climb heading 290° to 1700' before proceeding on course.
 Rwy 30: Climb heading 296° to 1300' before proceeding on course.

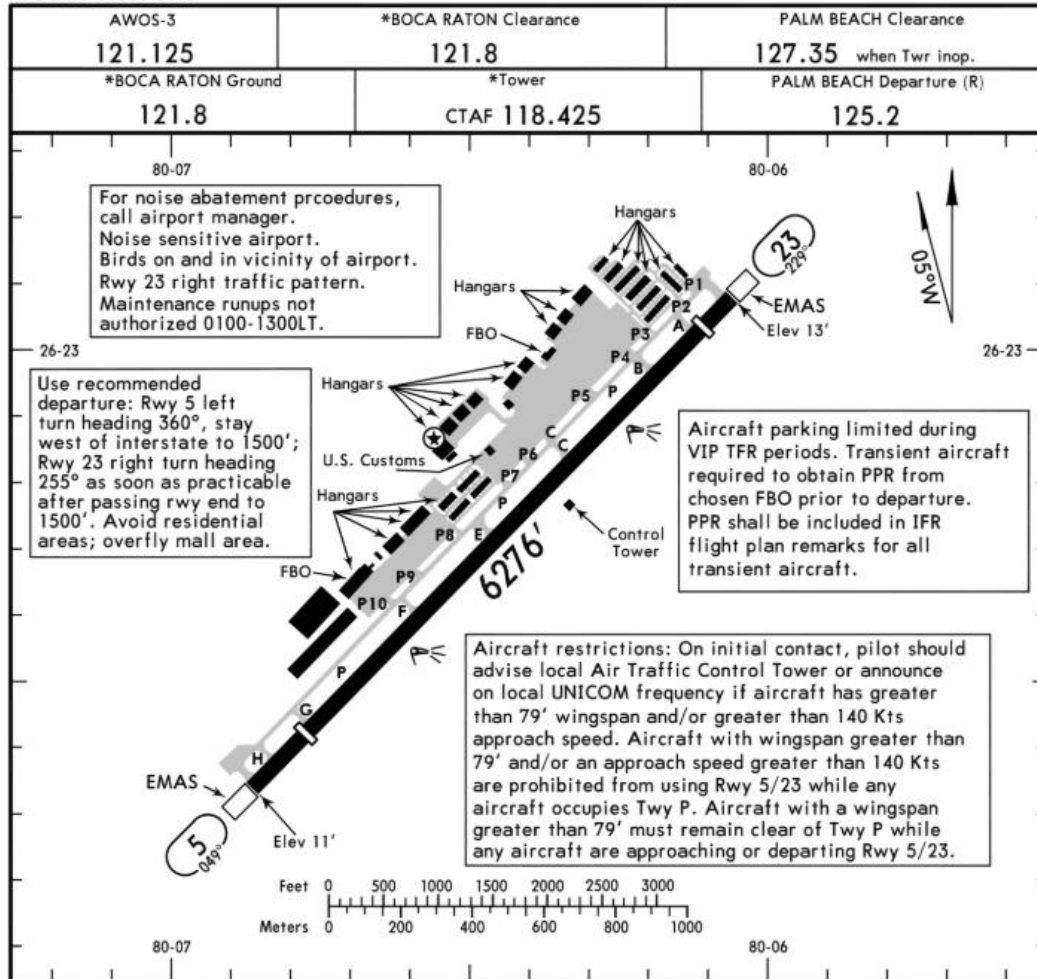
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NAVIGRAPH CHARTS INTENDED FOR FLIGHT SIMULATION ONLY - NOT FOR NAVIGATIONAL USE

KBCT/BCT
 Apt Elev **13'**
 N26 22.7 W080 06.5

JEPPESEN
 4 SEP 20 **(10-9)** Eff 10 Sep

BOCA RATON, FLA
BOCA RATON



RWY		USABLE LENGTHS		TAKE-OFF	WIDTH
		LANDING	BEYOND		
		Threshold	Glide Slope		
5	① MIRL ① REIL ① PAPI-R (angle 3.00°) grooved	5580'			
23	① MIRL ① REIL ① PAPI-L (angle 3.00°) grooved	5898'			150'

① When Twr inop activate on 118.425.

TAKE-OFF				
	Rwy 5		① Rwy 23	
	Adequate Vis Ref	STD	With Min climb of 230'/NM to 300'	Other
1 & 2 Eng	1/4	1	1/4	300-1
3 & 4 Eng		1/2		

① Alternatively, with standard take-off minimums and a normal 200'/NM climb gradient, take-off must occur no later than 1700' prior to departure end of runway.

FOR FILING AS ALTERNATE	
Authorized Only When Local Weather Available	
	RNAV (GPS) Y Rwy 23
A	
B	
C	800-2
D	900-2 ³ / ₄

CHANGES: Notes, alternate minimums, chart format. © JEPPESEN, 2000, 2020. ALL RIGHTS RESERVED.

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KEYW/EYW

Apt Elev 3'
N24 33.4 W081 45.6

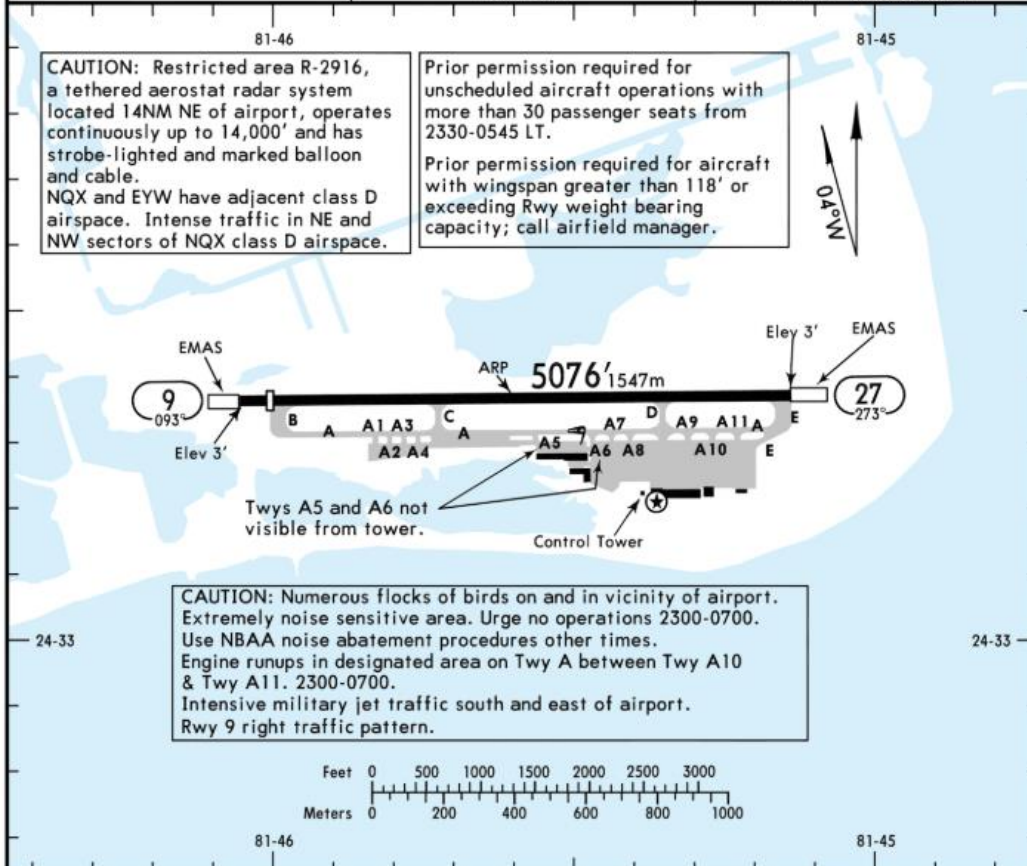


31 MAY 19 (10-9)

KEY WEST, FLA

KEY WEST INTL

ATIS (ASOS when Twr inop) 119.675	*KEY WEST Ground 121.9	*Tower CTAF 118.2
UNICOM 122.95	*NAVY KEY WEST Departure (R) 124.025	MIAMI Center (R) 133.5 when Dep inop.



ADDITIONAL RUNWAY INFORMATION

RWY		USABLE LENGTHS		TAKE-OFF	WIDTH
		LANDING	BEYOND		
		Threshold	Glide Slope		
9	① MIRL ① REIL ① PAPI-L (angle 3.00°) grooved	4801'			100'
27	① MIRL ① REIL ① PAPI-R (angle 3.00°) grooved	②		4801'	30m

- ① Activate on 118.2.
- ② LDA 4801'

TAKE-OFF & OBSTACLE DEPARTURE PROCEDURE		FOR FILING AS ALTERNATE	
All Rwys		Authorized Only When Local Weather Available	
Adequate Vis Ref		NDB-A	RNAV (GPS) Rwy 9
STD		RADAR-1	RNAV (GPS) Rwy 27
1 & 2 Eng	1/4	A	800-2
3 & 4 Eng	1/2	B	800-2
		C	
		D	

OBSTACLE DP: Rws 9, 27, climb on a heading between 087° clockwise to 033° from departure end of runway to avoid R-2916 and unmarked tethered balloon up to 14000'.

CHANGES: Usable lengths.

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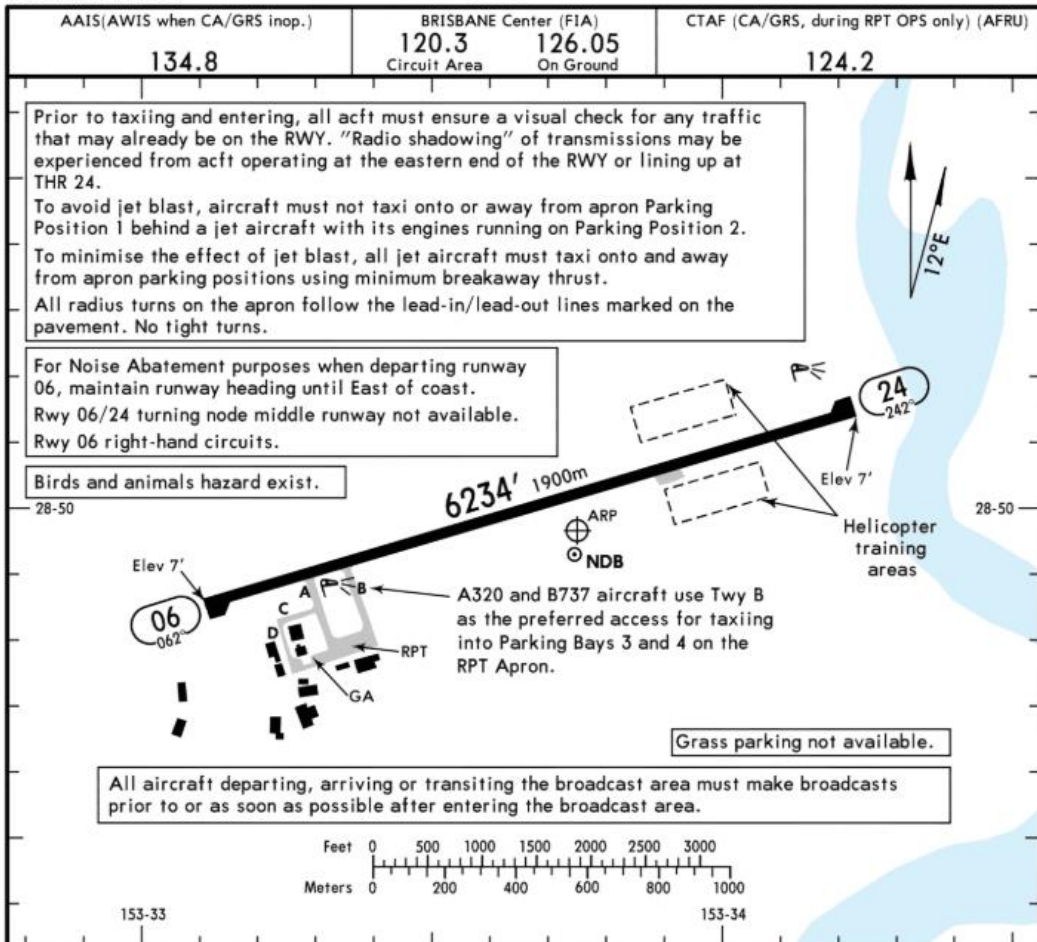
NAVIGRAPH CHARTS INTENDED FOR FLIGHT SIMULATION ONLY - NOT FOR NAVIGATIONAL USE

YBNA/BNK

Apt Elev 7'
S28 50.0 E153 33.7

JEPPESEN BALLINA, NSW, AUSTRALIA

7 AUG 20 (10-9) Eff 13 Aug BALLINA/BYRON GATEWAY



ADDITIONAL RUNWAY INFORMATION

RWY	USABLE LENGTHS			
	Threshold	Glide Slope	TAKE-OFF	WIDTH
06 ①	②RL(90m)	②REIL AT-VASI-R (angle 3.0°, MEHT 46')		98'
24 ②	②RL(90m)	②REIL AT-VASI-L (angle 3.0°, MEHT 48')		30m

① Standby power available.

② Activate on 121.3. PAL requires 3 one second pulses within five seconds to activate.

TAKE-OFF

All Rwys

STANDARD

1 Eng	300' - 2 km
2, 3 & 4 Eng	Single pilot acft without auto-feathering. Acft not above 5700 kg & not capable of Engine out climb gradient of 1.9%.
2, 3 & 4 Eng	300' - 2 km
2, 3 & 4 Eng	800m

FOR FILING AS ALTERNATE

	RNAV-Z (GNSS) Rwy 06 RNAV-Z (GNSS) Rwy 24 NDB Rwy 24		RNAV-X (RNP) Rwy 06 RNAV-X (RNP) Rwy 24
	Actual Aero QNH	Forecast Terminal QNH	
A	1183' - 4.4 km	1283' - 4.4 km	1203' - 4.4 km
B			
C	1423' - 6.0 km	1523' - 6.0 km	1423' - 6.0 km
D	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE

CHANGES: Taxiway, taxiway idents, grass parking note.

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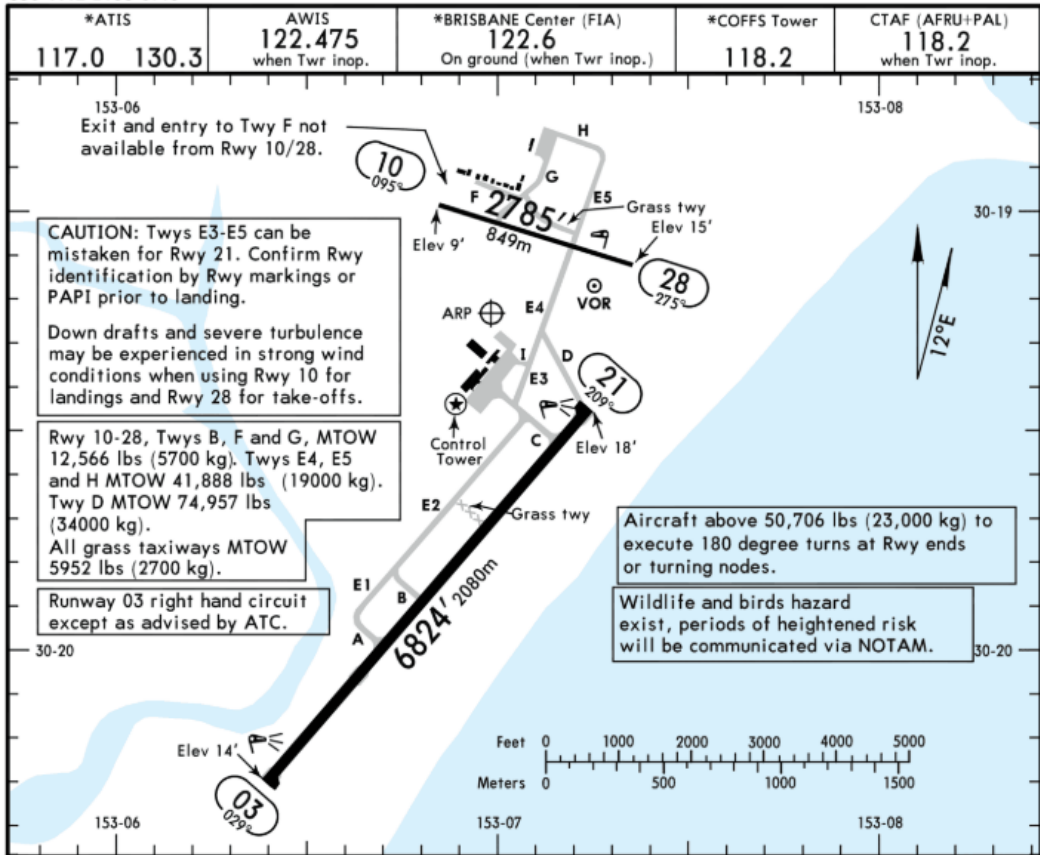
NAVIGRAPH CHARTS INTENDED FOR FLIGHT SIMULATION ONLY - NOT FOR NAVIGATIONAL USE

YCFS/CFS

Apt Elev 18'
S30 19.2 E153 07.0

JEPPESEN COFFS HARBOUR, NSW, AUST

17 APR 20 (10-9) COFFS HARBOUR



ADDITIONAL RUNWAY INFORMATION

RWY	SURFACE	USABLE LENGTHS			WIDTH
		Threshold	Glide Slope	TAKE-OFF	
03	①② MIRL ①② PAPI-L (angle 3.0°, MEHT 51') grooved				148' 45m
21					
10		③ 2379' 725m			59' 18m
28					

① Activate on 118.2. ② Standby power available.
③ Last 407' (124m) is unavailable for landing distance computations.

	TAKE-OFF
	All Rwys
	STANDARD
1 Eng	300' - 2 km
2, 3 & 4 Eng	Single pilot acft without auto-feathering. Acft not above 5700 kg & not capable of Engine out climb gradient of 1.9%. 300' - 2 km
2, 3 & 4 Eng	800m

FOR FILING AS ALTERNATE

	Actual Aero QNH	Forecast Terminal QNH
A	1182'-4.4 km	1282'-4.4 km
B		
C	1272'-6.0 km	1372'-6.0 km
D	1272'-7.0 km	1372'-7.0 km

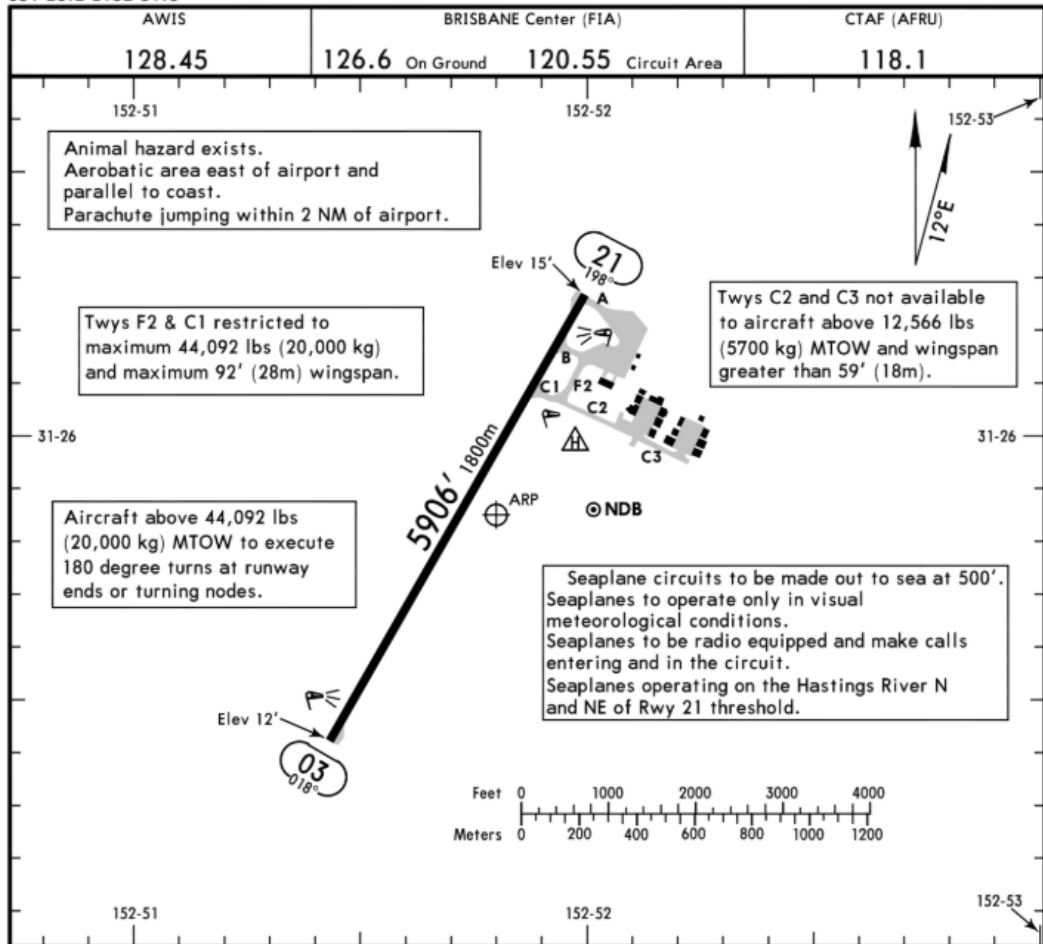
CHANGES: Grass taxiway decommissioned. © JEPPESEN, 1999, 2020. ALL RIGHTS RESERVED.

NAVIGRAPH CHARTS INTENDED FOR FLIGHT SIMULATION ONLY - NOT FOR NAVIGATIONAL USE

YPMQ/PQQ

Apt Elev 15'
S31 26.2 E152 51.8

JEPPESEN PORT MACQUARIE, NSW, AUST
7 AUG 20 (10-9) Eff 13 Aug PORT MACQUARIE



ADDITIONAL RUNWAY INFORMATION

RWY	USABLE LENGTHS	LANDING BEYOND	TAKE-OFF	WIDTH
03 21	① RL (60m) ②③ PAPI-L	grooved		147' 45m

- ① Activate on 122.3, sunset to sunrise. Standby power available.
- ② Activate on 122.3. Standby power available.
- ③ Angle 3.0°, MEHT 54'.

TAKE-OFF	FOR FILING AS ALTERNATE	
	Actual Aero QNH	Forecast Terminal QNH
All Rwys		
STANDARD		
1 Eng	300' - 2 km	
2, 3 & 4 Eng	Single pilot acft without auto-feathering. Acft not above 5700 kg & not capable of Engine out climb gradient of 1.9%.	
	300' - 2 km	
2, 3 & 4 Eng	800m	
	A	1235' - 4.4 km
	B	1335' - 4.4 km
	C	1415' - 6.0 km
	D	1515' - 6.0 km
		NOT APPLICABLE

CHANGES: Seaplane note added.

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NAVIGRAPH CHARTS INTENDED FOR FLIGHT SIMULATION ONLY - NOT FOR NAVIGATIONAL USE

YWLM/NTL

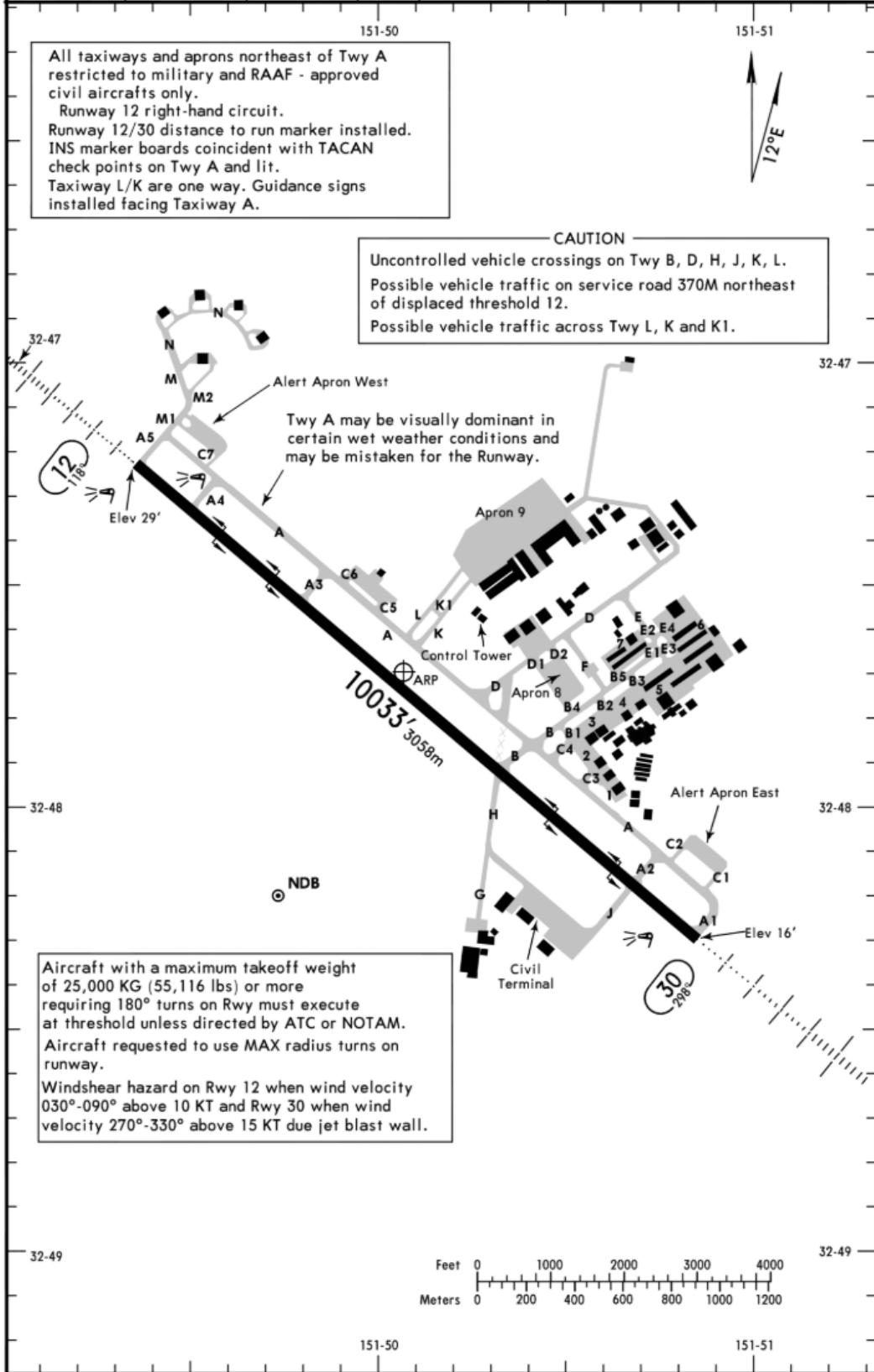
Apt Elev 31'
S32 47.7 E151 50.1

JEPPESEN WILLIAMTOWN, NSW, AUSTRALIA

30 OCT 20 10-9 Eff 5 Nov

WILLIAMTOWN (MILITARY)

*ATIS 134.45 365	WILLY Delivery 130.35	*WILLY Ground 121.8	*Tower 118.3	CTAF (AFRU+PAL) 118.3 when Twr inop.	*WILLY Approach (Dep) 135.7	BRISBANE Center (FIA) 125.7 when Dep inop.
------------------------	--------------------------	------------------------	-----------------	--	--------------------------------	--



All taxiways and aprons northeast of Twy A restricted to military and RAAF - approved civil aircrafts only.
Runway 12 right-hand circuit.
Runway 12/30 distance to run marker installed.
INS marker boards coincident with TACAN check points on Twy A and lit.
Taxiway L/K are one way. Guidance signs installed facing Taxiway A.

CAUTION
Uncontrolled vehicle crossings on Twy B, D, H, J, K, L.
Possible vehicle traffic on service road 370M northeast of displaced threshold 12.
Possible vehicle traffic across Twy L, K and K1.

Twy A may be visually dominant in certain wet weather conditions and may be mistaken for the Runway.

Aircraft with a maximum takeoff weight of 25,000 KG (55,116 lbs) or more requiring 180° turns on Rwy must execute at threshold unless directed by ATC or NOTAM.
Aircraft requested to use MAX radius turns on runway.
Windshear hazard on Rwy 12 when wind velocity 030°-090° above 10 KT and Rwy 30 when wind velocity 270°-330° above 15 KT due jet blast wall.

CHANGES: None.

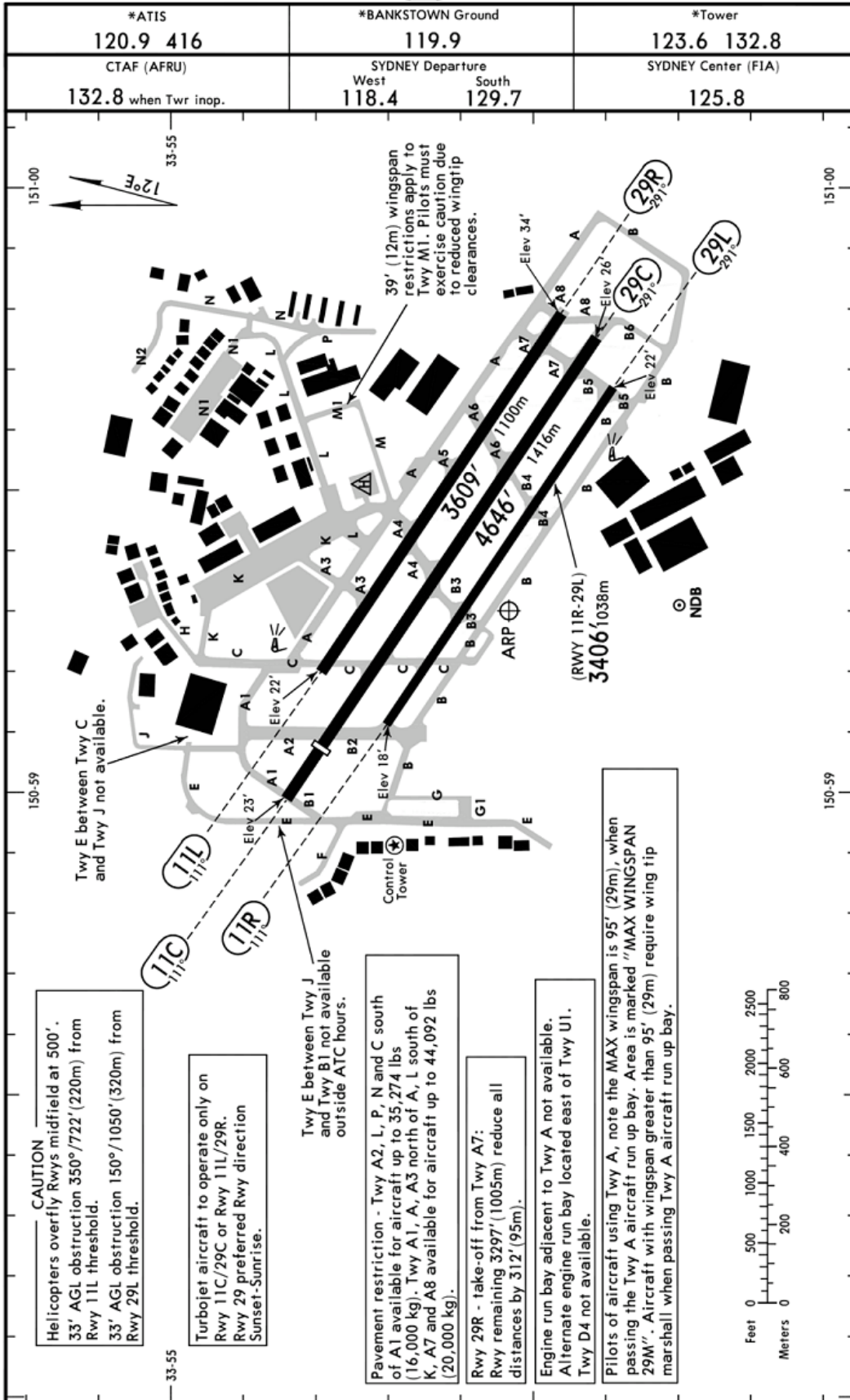
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NAVIGRAPH CHARTS INTENDED FOR FLIGHT SIMULATION ONLY - NOT FOR NAVIGATIONAL USE

YSBK/BWU

Apt Elev **34'**
S33 55.5 E150 59.3

JEPPESEN SYDNEY, NSW, AUSTRALIA
29 MAY 20 **(20-9)** **BANKSTOWN**



CHANGES: None.

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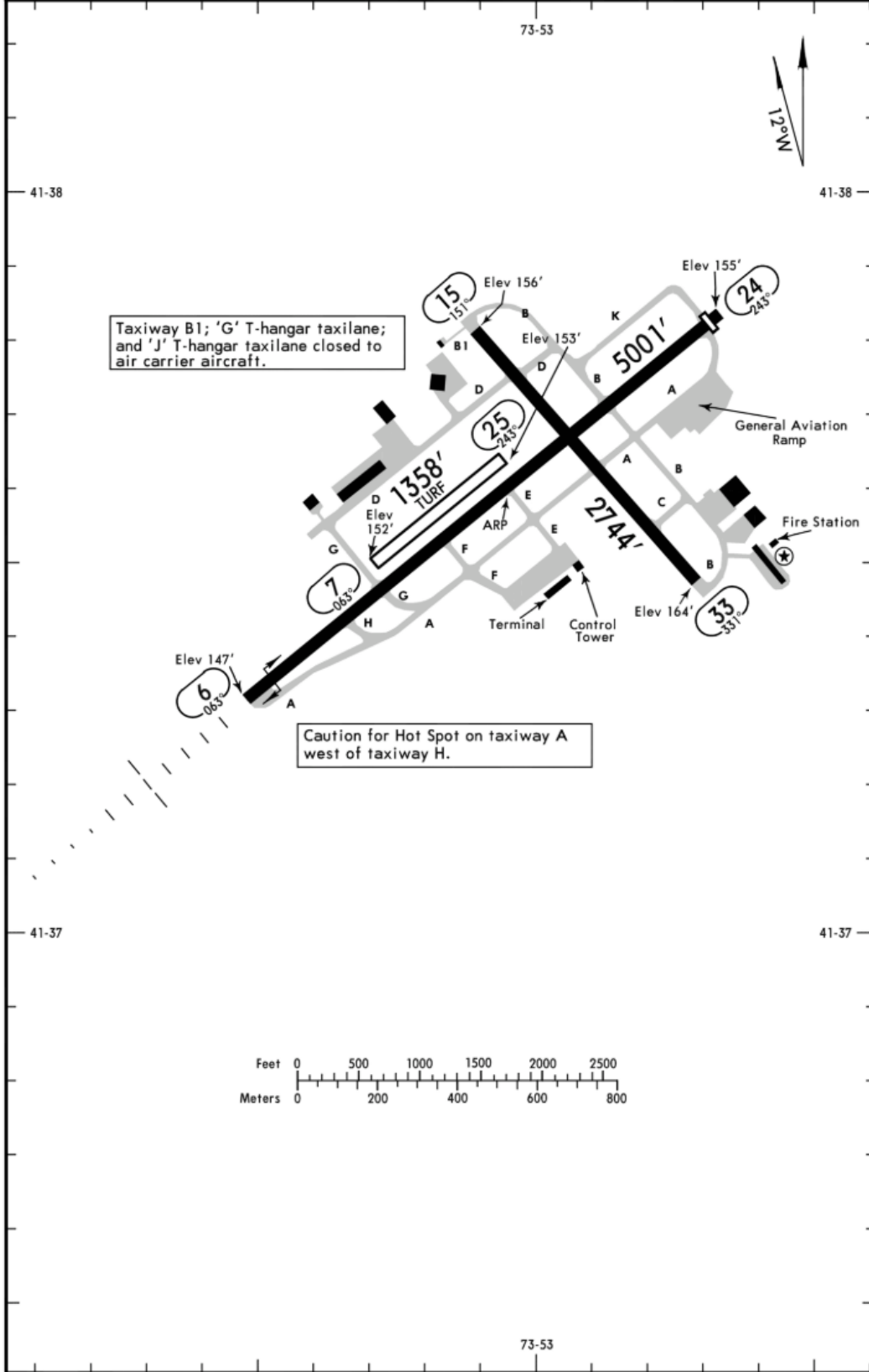
NAVIGRAPH CHARTS INTENDED FOR FLIGHT SIMULATION ONLY - NOT FOR NAVIGATIONAL USE

KPOU/POU
 Apt Elev **164'**
 N41 37.6 W073 53.1

JEPPESEN
 4 SEP 20 **(10-9)** Eff 10 Sep

POUGHKEEPSIE, NY
 HUDSON VALLEY REGL

ATIS (ASOS when Twr inop)	*HUDSON VALLEY REGL Clearance	*Ground	*Tower	UNICOM	NEW YORK Departure (R)
126.75	121.8	121.8	CTAF 124.0	122.95	132.75



Taxiway B1; 'G' T-hangar taxilane; and 'J' T-hangar taxilane closed to air carrier aircraft.

Caution for Hot Spot on taxiway A west of taxiway H.

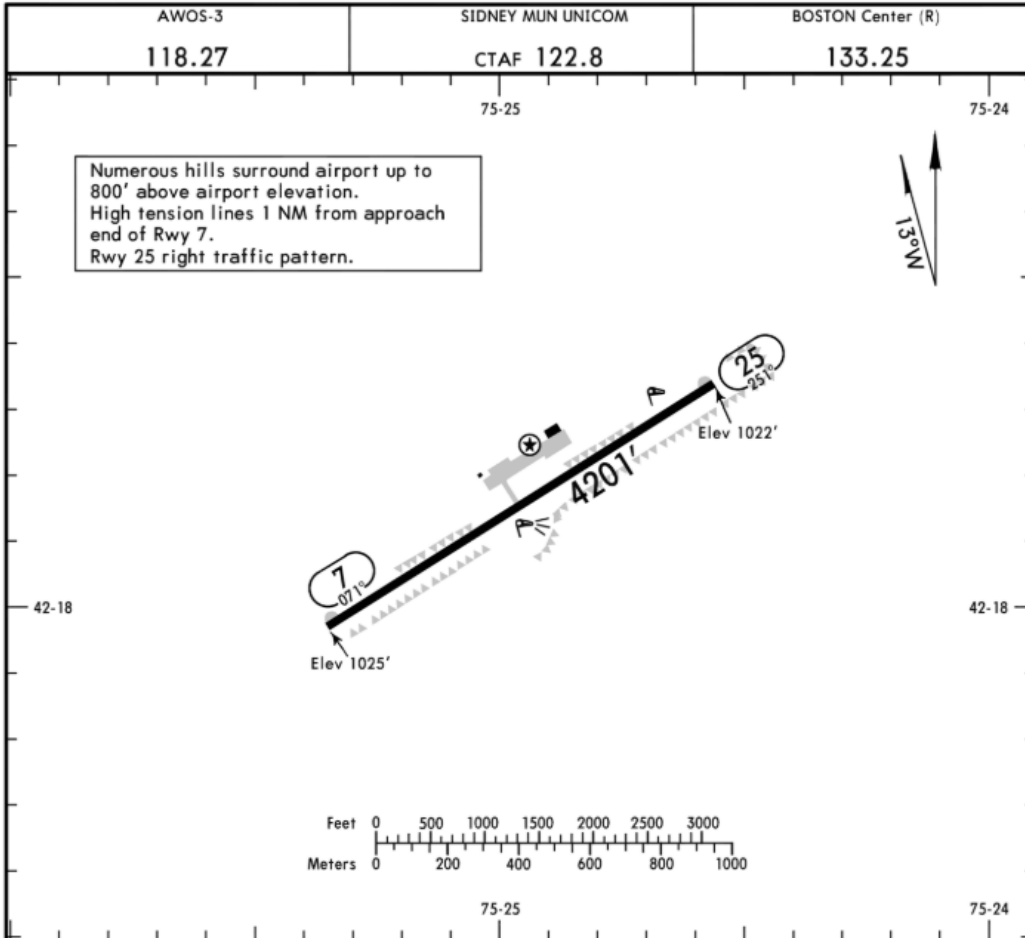
CHANGES: EMAS removed, Rwy 33 end elevation, airport diagram. © JEPPESEN, 2001, 2020. ALL RIGHTS RESERVED.

NAVIGRAPH CHARTS INTENDED FOR FLIGHT SIMULATION ONLY - NOT FOR NAVIGATIONAL USE

N23/SXY
 Apt Elev **1027'**
 N42 18.2 W075 25.0

JEPPESEN
 1 MAY 20 **(10-9)**

SIDNEY, NY
 SIDNEY MUN



RWY	ADDITIONAL RUNWAY INFORMATION			WIDTH
	USABLE LENGTHS		TAKE-OFF	
	Threshold	Landing Beyond		Glide Slope
7	① MIRL	① REIL		75'
25	① MIRL	① REIL	PAPI-R (angle 3.66°)	

① Activate on 122.8.

TAKE-OFF & OBSTACLE DEPARTURE PROCEDURE							
Rwy 7				Rwy 25			
	With Min climb of 340'/NM to 2300'		For Visual Climb Over Airport	With Min climb of 550'/NM to 1800'		With Min climb of 290'/NM to 2000'	For Visual Climb Over Airport
	Adequate Vis Ref	STD		Adequate Vis Ref	STD		
1 & 2 Eng	1/4	1	1600-3	1/4	1	600-2 1/2	1600-3
3 & 4 Eng		1/2			1/2		

OBSTACLE DP: Rwy 7, climb heading 071° to 2300' before proceeding on course. Rwy 25, climb heading 251° to 2000' before proceeding on course. All Rwys, obtain ATC approval for visual climb over airport when requesting IFR clearance. Climb in visual conditions to cross Sidney Municipal Airport at or above 2500' before proceeding on course.

FOR FILING AS ALTERNATE	
A	NA
B	
C	
D	

CHANGES: Radio removed.

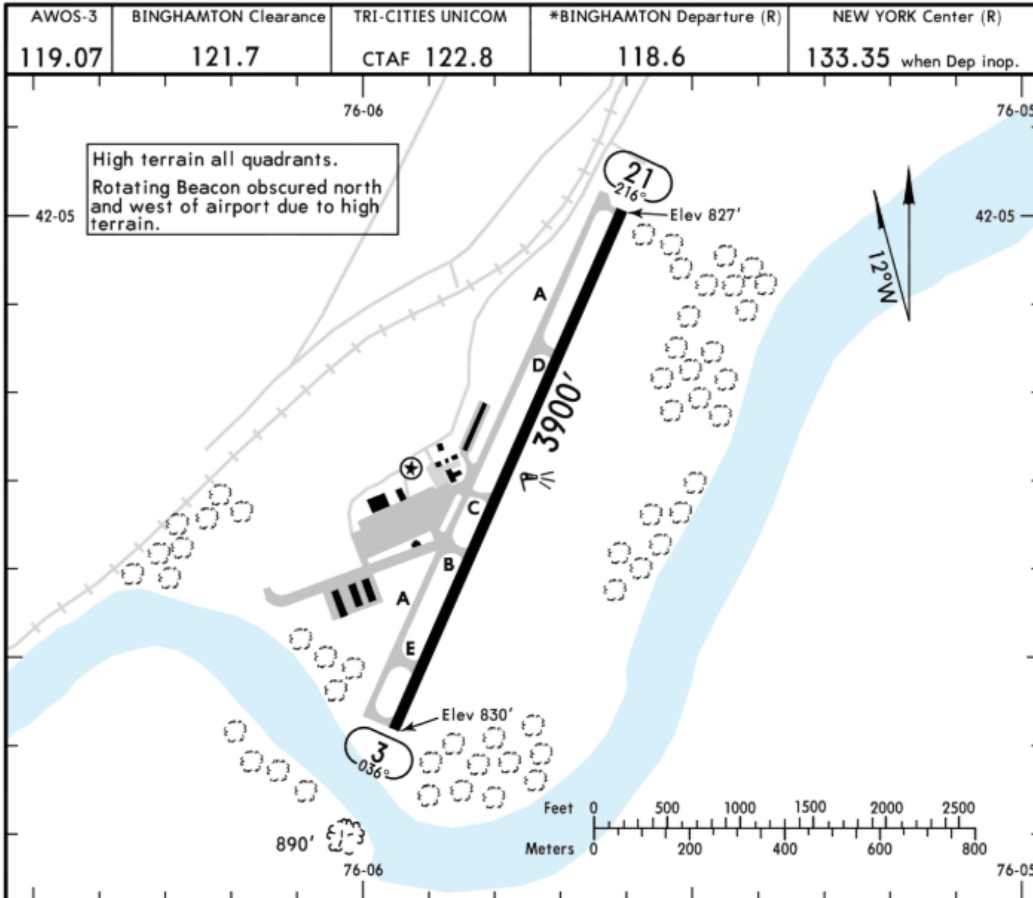
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NAVIGRAPH CHARTS INTENDED FOR FLIGHT SIMULATION ONLY - NOT FOR NAVIGATIONAL USE

KCZG
 Apt Elev **833'**
 N42 04.7 W076 05.8

JEPPESEN
 14 FEB 14 **(10-9)**

ENDICOTT, NY
TRI-CITIES



RWY	USABLE LENGTHS		TAKE-OFF	WIDTH
	LANDING BEYOND Threshold	Glide Slope		
3 ① 21	② MIRL ② REIL ② MIRL ② REIL PAPI-R (angle 4.0°)			75'

- ① Limited to 30,000 lbs.
- ② Activate on 122.8.

TAKE-OFF & OBSTACLE DEPARTURE PROCEDURE							
Rwy 3				Rwy 21			
	With Min climb of 515'/NM to 1700'		For Climb in Visual Conditions	With Min climb of 604'/NM to 2100'		For Climb in Visual Conditions	
	Adequate Vis Ref	STD		Adequate Vis Ref	STD		
1 & 2 Eng	1/4	1	700-2	1600-2 1/2	1/4	1	900-3
3 & 4 Eng		1/2					

OBSTACLE DP: Rwy 3, climb heading 036° to 2000' before proceeding on course or for climb in visual conditions: cross Tri-Cities Airport at or above 2300' before proceeding on course.
 Rwy 21, climb heading 216° to 2200' before proceeding on course or for climb in visual conditions: cross Tri-Cities Airport at or above 2300' before proceeding on course.

FOR FILING AS ALTERNATE	
A	NA
B	
C	
D	

CHANGES: Note removed, REIL added. © JEPPESEN, 2000, 2014. ALL RIGHTS RESERVED.

NAVIGRAPH CHARTS INTENDED FOR FLIGHT SIMULATION ONLY - NOT FOR NAVIGATIONAL USE

KELM/ELM

Apt Elev **955'**
N42 09.6 W076 53.5



4 OCT 19

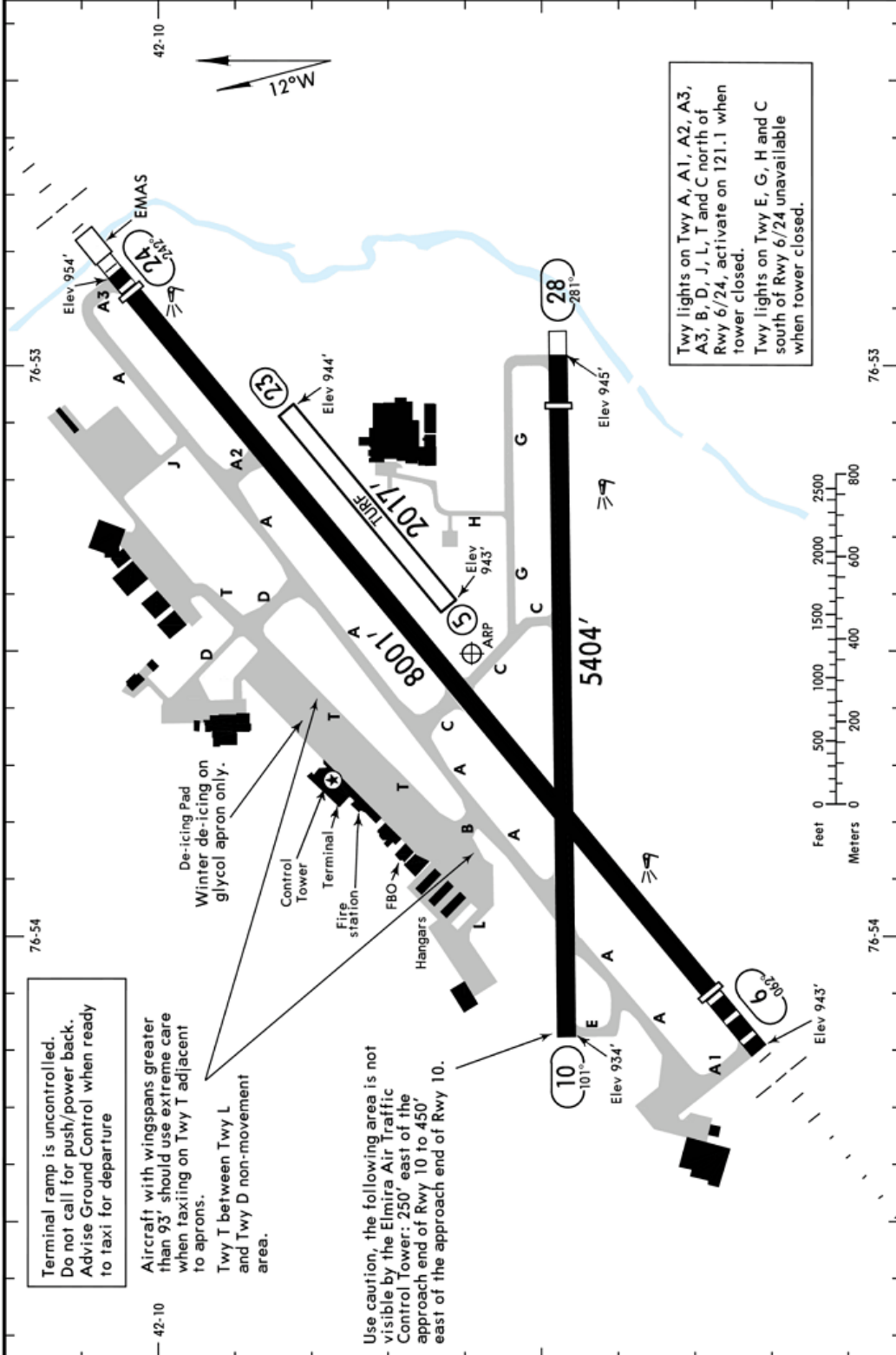
10-9

Eff 10 Oct

ELMIRA/CORNING, NY

ELMIRA/CORNING REGL

ATIS (ASOS when Twr inop)		*ELMIRA Clearance		BUFFALO Radio (when Clearance inop)	
125.475		121.9		122.2	
(use BUFFALO Radio when Clearance inop)					
*ELMIRA Ground		*Tower		*ELMIRA Departure (R)	
121.9		CTAF 121.1		NEW YORK Center (R)	
				133.35 when Dep inop.	



CHANGES: Communications.

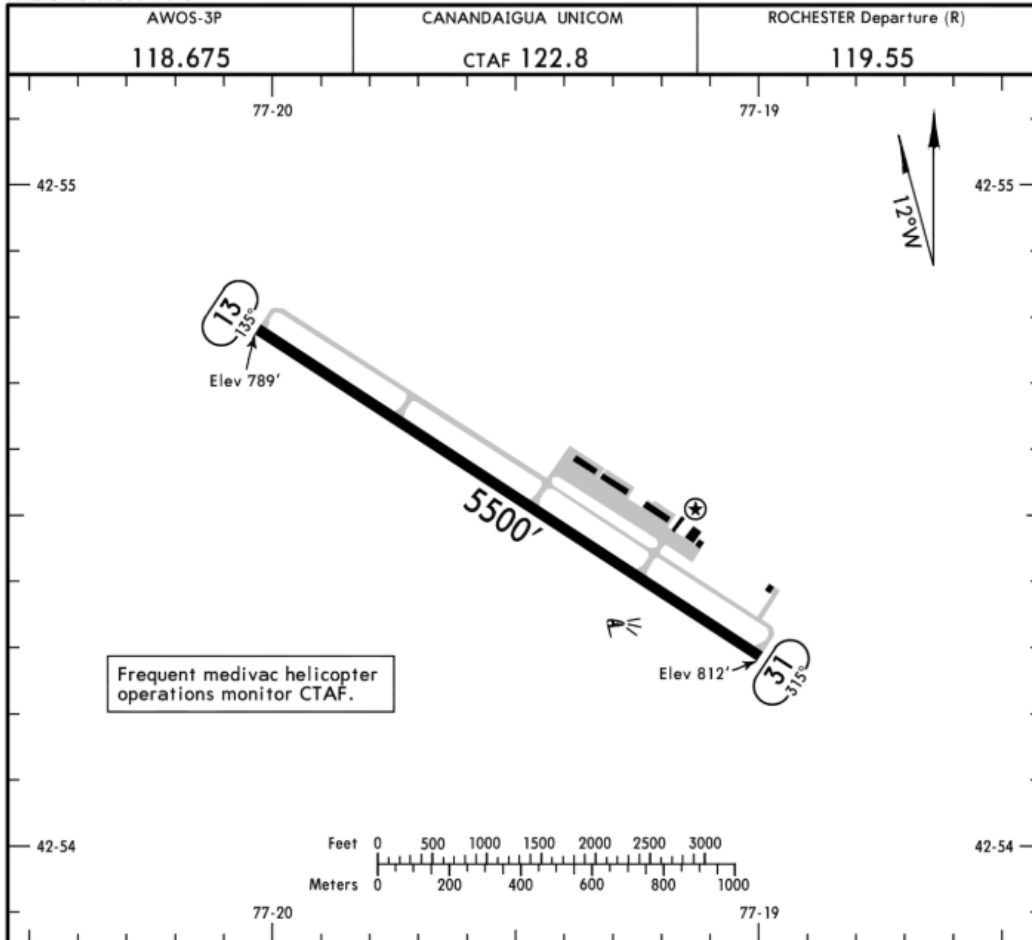
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NAVIGRAPH CHARTS INTENDED FOR FLIGHT SIMULATION ONLY - NOT FOR NAVIGATIONAL USE

KIUA
 Apt Elev **814'**
 N42 54.5 W077 19.5

JEPPESEN
 1 JUN 18 **(10-9)**

CANANDAIGUA, NY
CANANDAIGUA



Frequent medivac helicopter operations monitor CTAF.

ADDITIONAL RUNWAY INFORMATION

RWY	USABLE LENGTHS LANDING BEYOND	TAKE-OFF	WIDTH
13 31	① MIRL REIL ② PAPI-L	grooved	100'

- ① Activate on 122.8.
- ② Angle 3.00°.

TAKE-OFF All Rwys		FOR FILING AS ALTERNATE	
Adequate Vis Ref	STD	A	NA
1 & 2 Eng	1	B	
	1/4	C	
3 & 4 Eng	1/2	D	

CHANGES: Lighting.

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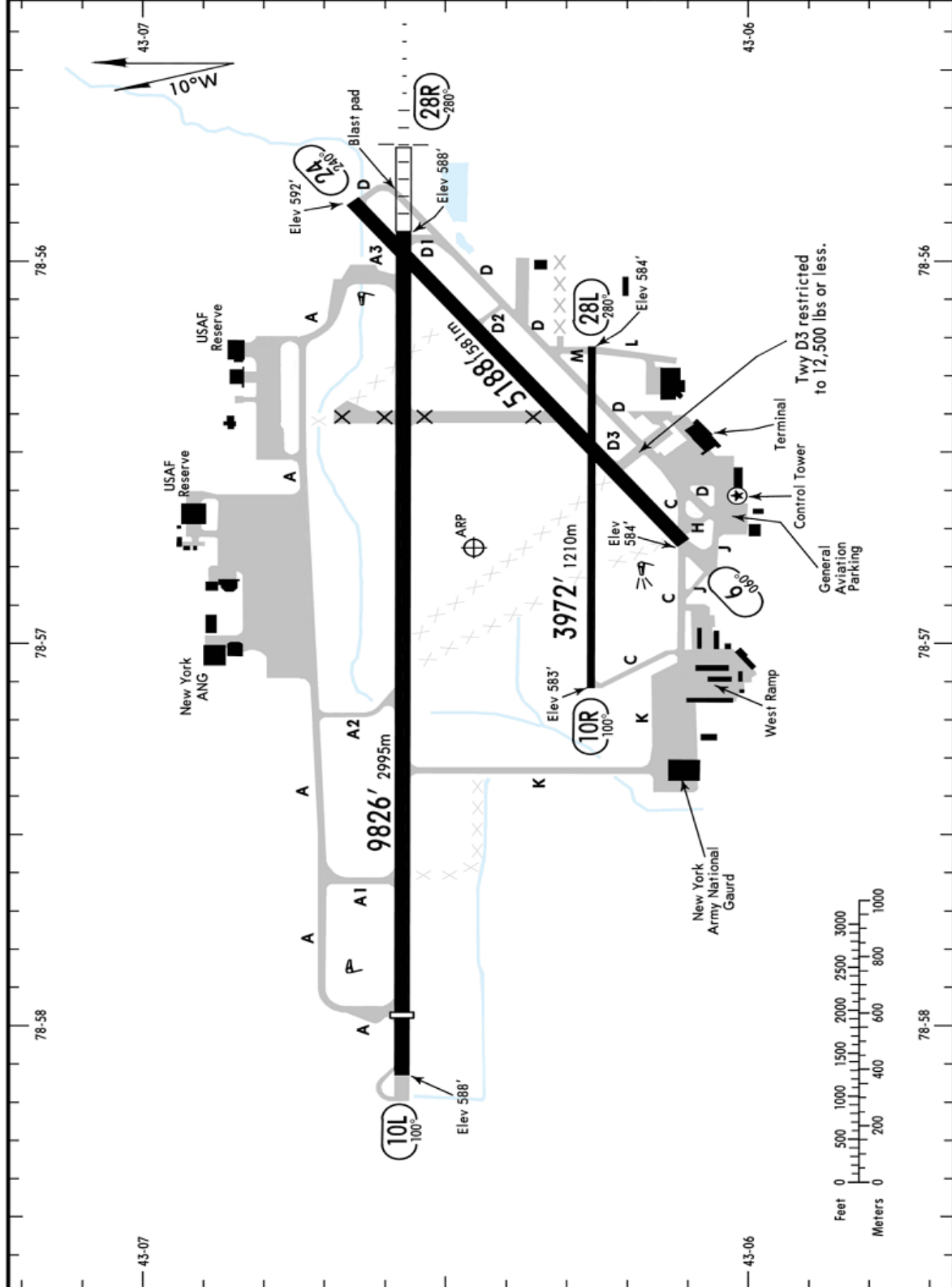
AMEND 1

KIAG/IAG
 Apt Elev **592'**
 N43 06.5 W078 56.8

JEPPESEN
 12 JUN 20 **(10-9)**

NIAGARA FALLS, NY
NIAGARA FALLS INTL

*ATIS 120.8	*NIAGARA Clearance 119.25	*Ground 125.3	*Tower CTAF 118.5	UNICOM 122.95	BUFFALO Departure (R) 126.5
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CHANGES: Hot Spots removed, chart format. © JEPPESEN, 2010, 2020. ALL RIGHTS RESERVED.

NAVIGRAPH CHARTS INTENDED FOR FLIGHT SIMULATION ONLY - NOT FOR NAVIGATIONAL USE

CYTZ/YTZ

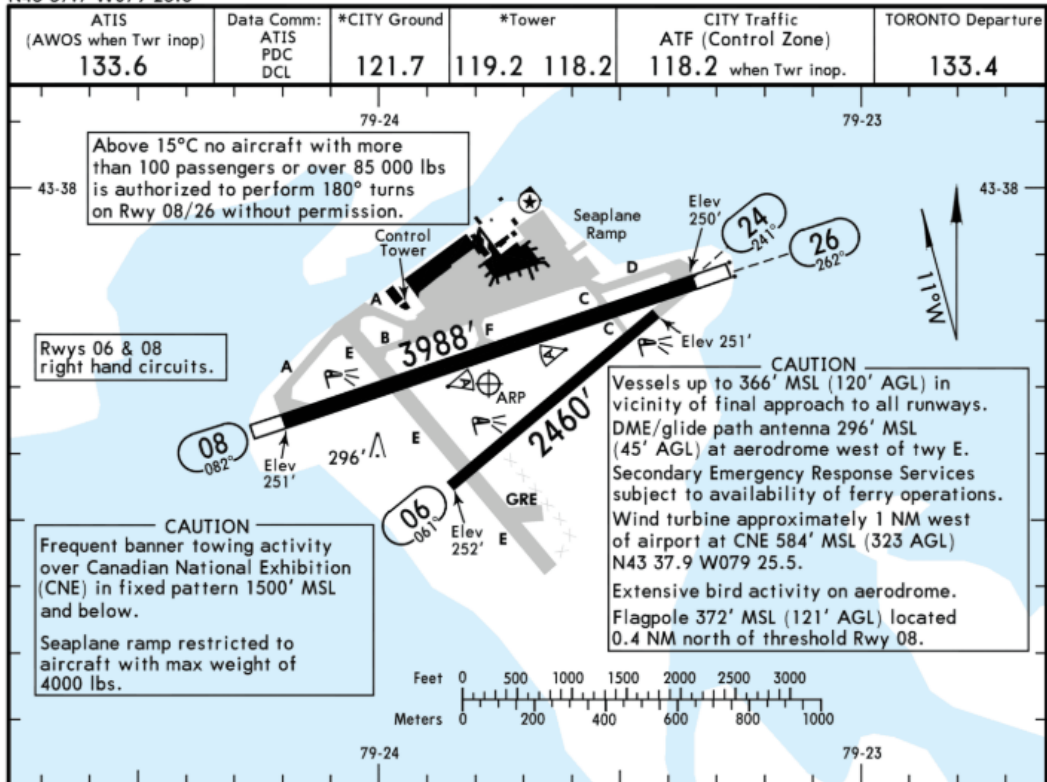
Apt Elev 252'
N43 37.7 W079 23.8

JEPPESEN

10 JUL 20
Eff 16 Jul (30-9)

TORONTO, ONT

TORONTO/BISHOP TORONTO CITY



RWY	USABLE LENGTHS	LANDING BEYOND	TAKE-OFF	WIDTH
06 24	MIRL			100'
08 26	HIRL CL REIL ②③ PAPI-R (angle 3.9°) RVR	3045'		150'
	HIRL CL ALS REIL ②④ APAPI-R (angle 4.8°) RVR	3290'		

① Three white inset pre-threshold centerline lights. Two pairs of inset white lights 1099' upwind of each threshold mark. Yellow rwy edge lights for final 1305' Rwy 26 and Rwy 08. ② For aircraft with eye-to-wheel height up to 10'. ③ CAUTION: PAPI approach slope Rwy 08 will ensure clearance over tall vessels.
④ CAUTION: APAPI Rwy 26 approach slope 4.8°. APAPI approach slope Rwy 26 will ensure clearance over vessels and chimney 952' MSL (700' AGL) 2.6 NM from threshold.

① TAKE-OFF & DEPARTURE PROCEDURE			
② Rwy 08		③ Rwy 26	
④ Requires a minimum climb gradient of 380'/NM to 1200'. Climb heading 095° to 3000'. Proceed on course after 5 DME ITZ.		Climbing LEFT turn heading 150° to 2000'. Proceed on course after 5 DME ITZ.	
Authorized Air Carriers	All Other Aircraft	Authorized Air Carriers	All Other Aircraft
HIRL or CL or RCLM		HIRL or RCLM	
A	RVR 12	RVR 12	RVR 26
B	or 1/4	or 1/4	or 1/2
C			
D			
③ Rwy 24		Rwys 06	
Climbing LEFT turn heading 150° to 2000'. Proceed on course after 3 DME ITZ.		Pilots are responsible for determining minimum climb gradient and/or routing for obstacle and terrain avoidance. Pilots may depart IFR by using a take-off visibility that will allow avoidance of obstacles on departure, in no case less than 1/2 mile.	
A	1/2		
B			
C			
D			

① Flight between hdg 019° clockwise to hdg 057° prohibited below 3100'.
② Ships to 316' MSL approximately 0.1 NM past departure end of rwy.
③ Ships to 363' MSL approximately 0.4 NM past departure end of rwy.

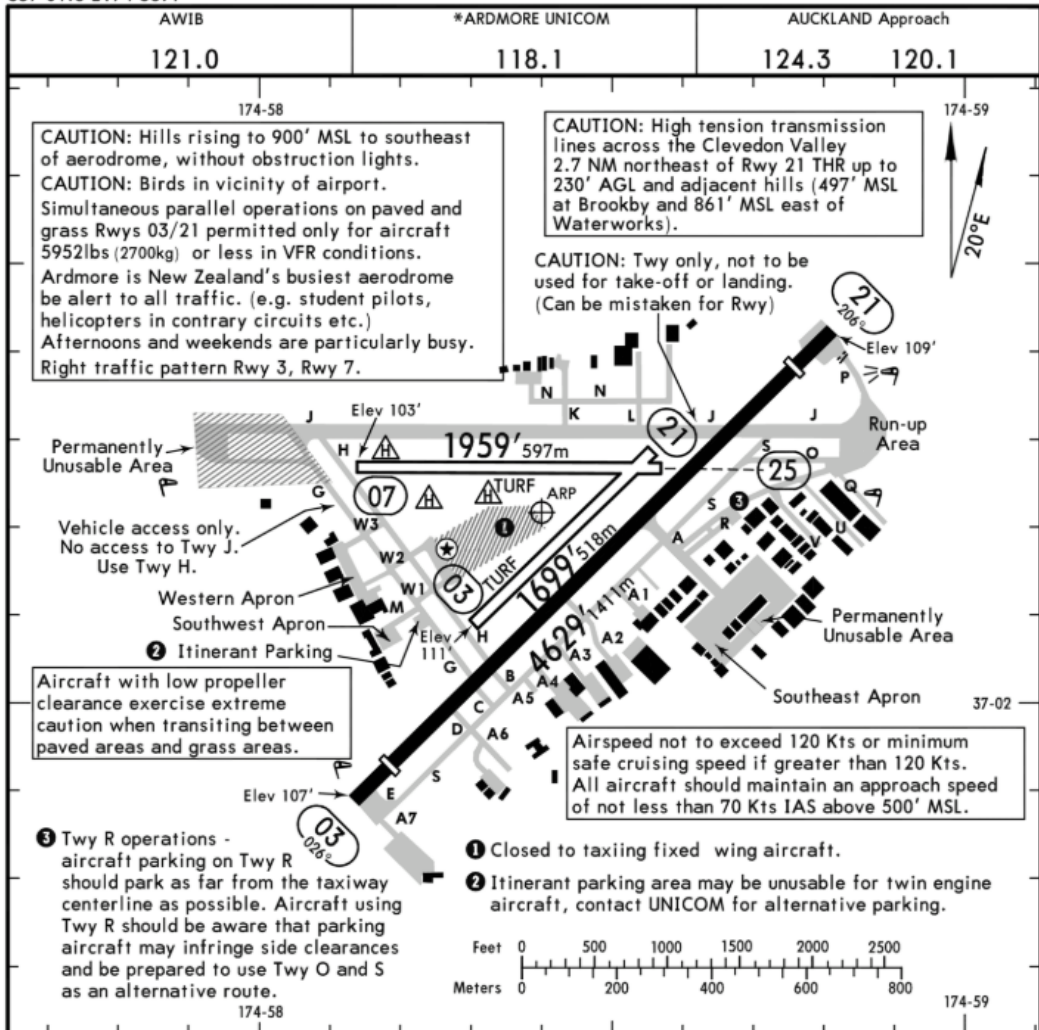
④ DEPARTURE CLIMB RATE V/V (FPM)								
GROUND SPEED	90	120	140	160	180	200	250	300
380 FT/NM	570	760	890	1020	1140	1270	1590	1900

CHANGES: Tower frequency added. © JEPPESEN, 1998, 2020. ALL RIGHTS RESERVED.

NAVIGRAPH CHARTS INTENDED FOR FLIGHT SIMULATION ONLY - NOT FOR NAVIGATIONAL USE

NZAR/AMZ
 Apt Elev 111'
 S37 01.8 E174 58.4

JEPPESEN ARDMORE, NEW ZEALAND
 7 SEP 18 (10-9) Eff 13 Sep
 ARDMORE



RWY	ADDITIONAL RUNWAY INFORMATION				
		USABLE LENGTHS		WIDTH	
		Threshold	Landing Beyond		TAKE-OFF
03	② RL (60m) ② APAPI (angle 3.0°)	4285'	1306m	4262' 1299m	148'
21	② RL (60m) ② ③ APAPI (angle 3.0°)	4262'	1299m	4285' 1306m	45m
03 TURF					59'
21 TURF					18m
07 TURF					59'
25 TURF					18m

② Pilot activated lighting 118.1.
 ③ **WARNING:** Rwy 21 APAPI use prohibited unless established on rwy centerline due to obstacle clearance infringement.

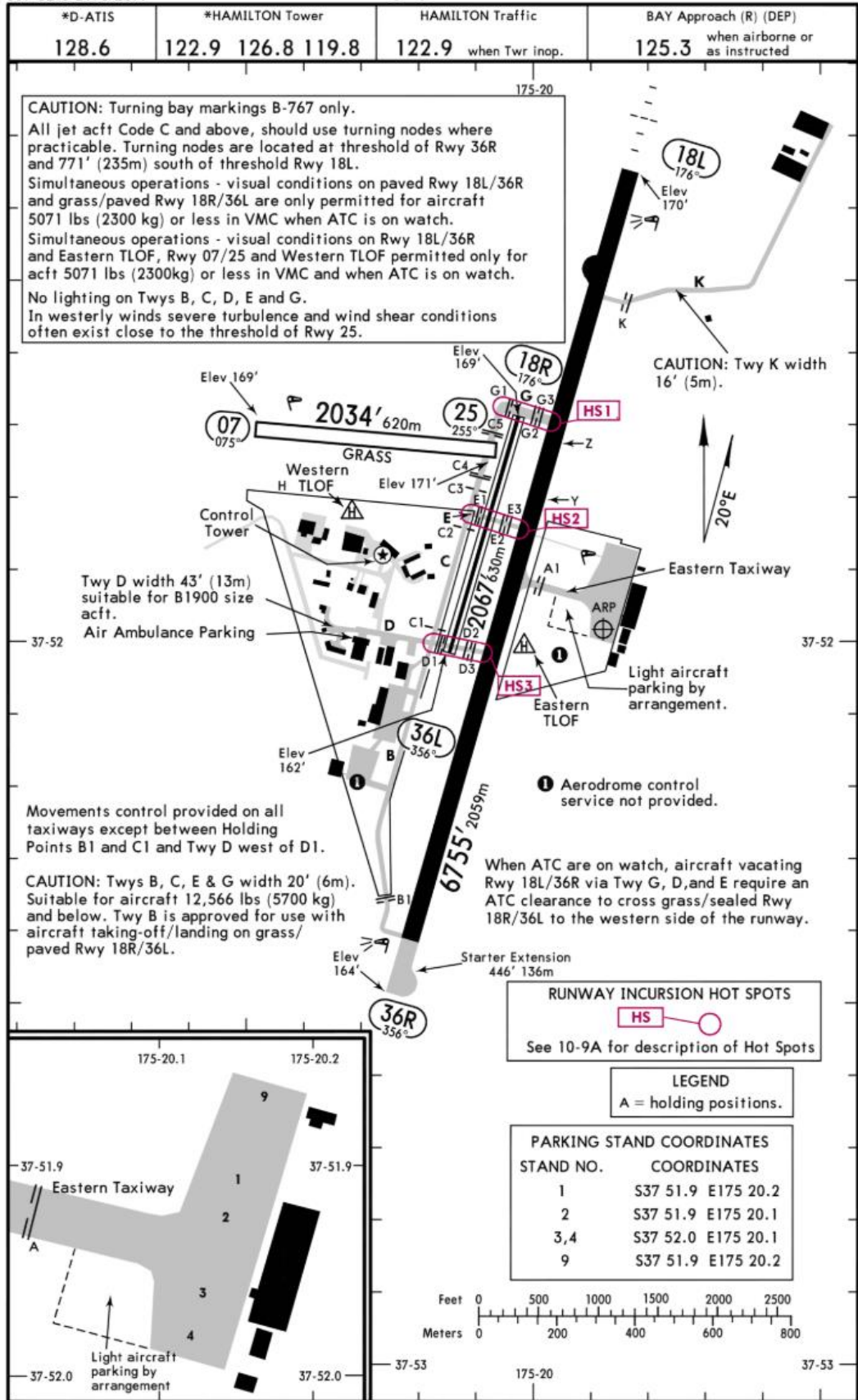
	TAKE-OFF			
	Rwy 21		Rwy 3	
	DAY	NIGHT	DAY	NIGHT
1 & 2 Eng	300' - 1500m	300' - 1500m	1000' - 1500m	1000' - 5 km
3 & 4 Eng				

CHANGES: Aprons, twys and buildings, twys V, U and Q added, notes 2,3 added. © JEPPESEN, 2007, 2018. ALL RIGHTS RESERVED.

NAVIGRAPH CHARTS INTENDED FOR FLIGHT SIMULATION ONLY - NOT FOR NAVIGATIONAL USE

NZHN/HLZ
 Apt Elev **172'**
 S37 52.0 E175 20.1

JEPPESEN HAMILTON, NEW ZEALAND
 HAMILTON
 30 OCT 20 **(10-9) Eff 5 Nov**



CHANGES: NDB removed. © JEPPESEN, 2002, 2020. ALL RIGHTS RESERVED.
NAVIGRAPH CHARTS INTENDED FOR FLIGHT SIMULATION ONLY - NOT FOR NAVIGATIONAL USE

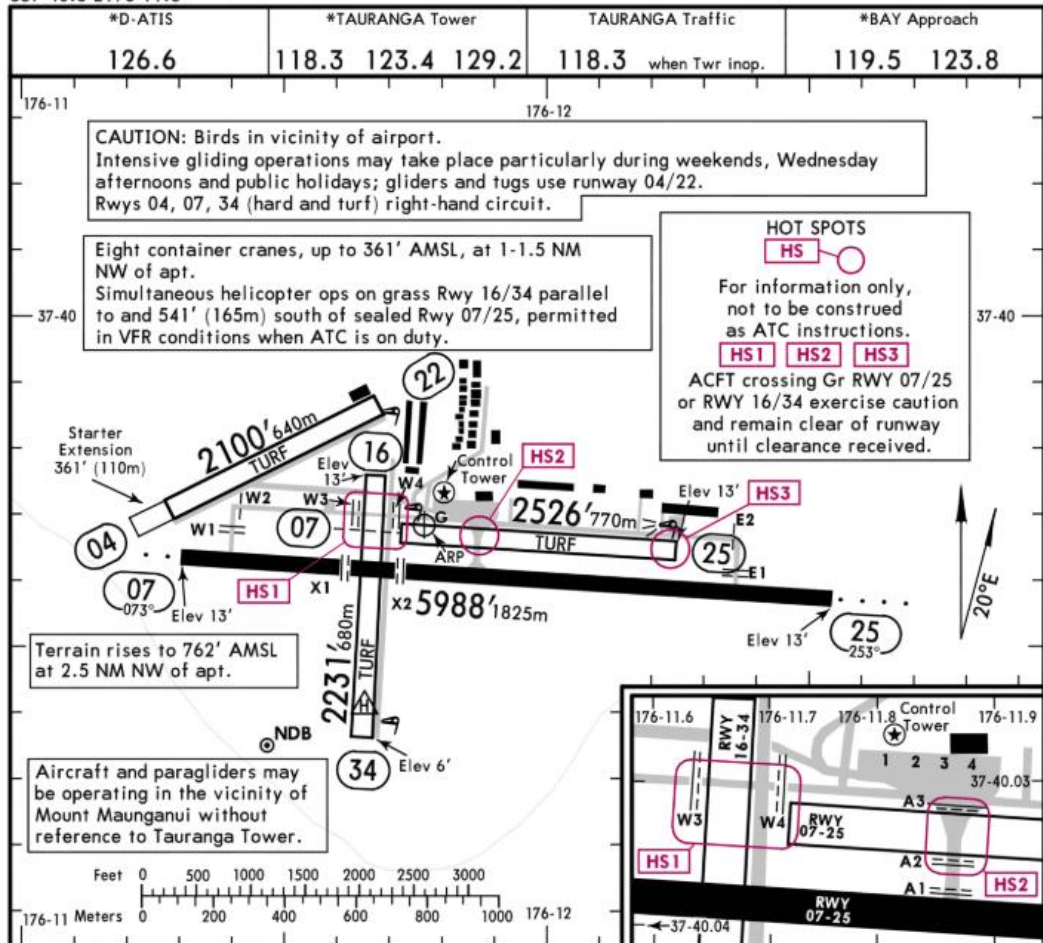
NZTG/TRG

Apt Elev **13'**
S37 40.3 E176 11.8

JEPPESEN TAURANGA, NEW ZEALAND

24 JAN 20 (10-9) Eff 30 Jan

TAURANGA



RWY	ADDITIONAL RUNWAY INFORMATION			USABLE LENGTHS		WIDTH
	Threshold	Landing Beyond	Glide Slope	TAKE-OFF		
04 22						197' 60m
07 HARD 25		① RL ① ALS ① PAPI (angle 3.0°)				148' 45m
07 TURF 25						180' 55m
16 34						148' 45m

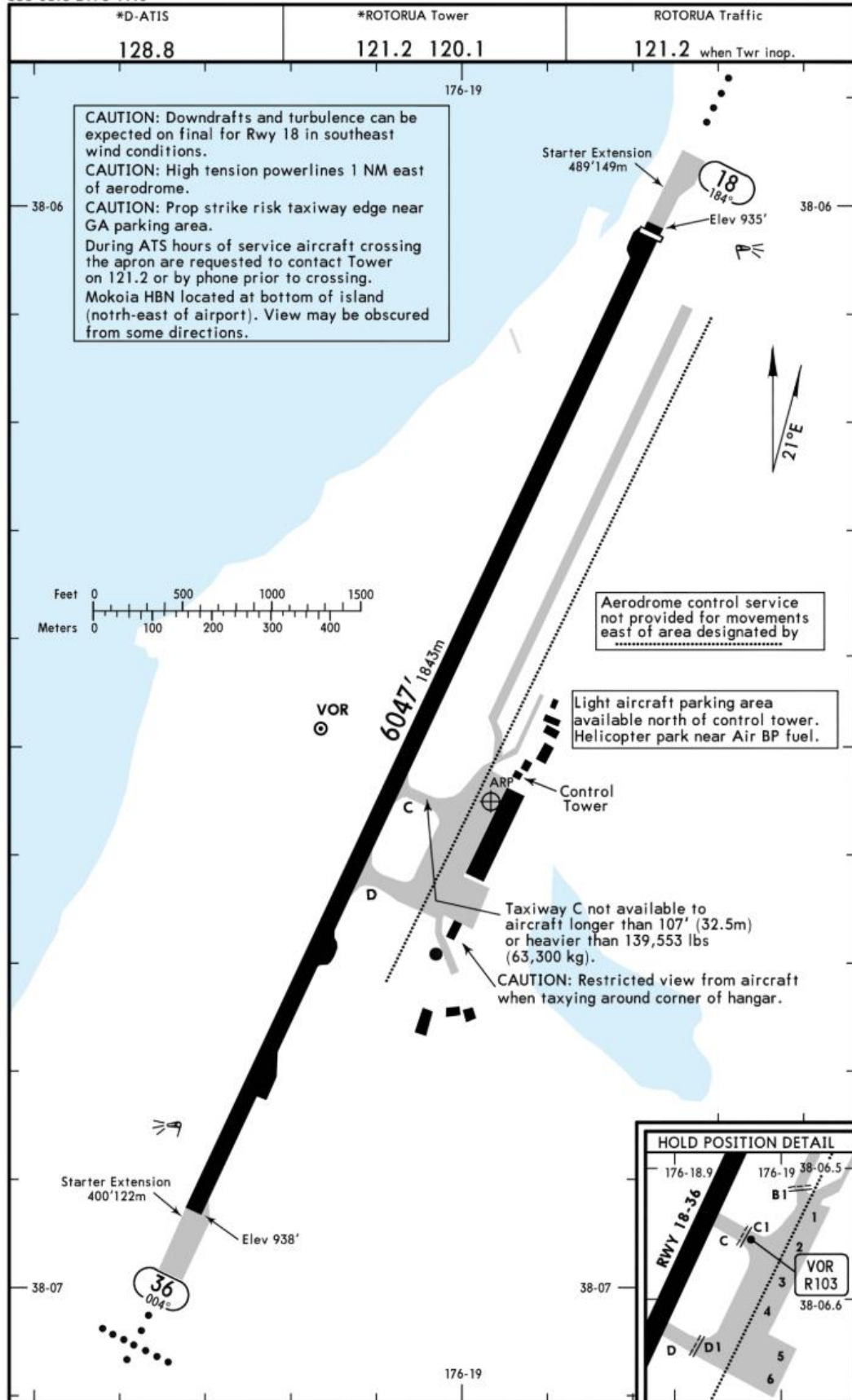
① Outside Tauranga Tower hours of service, remote control of lighting available from Christchurch Information on 123.8. Requests by arriving ACFT can also be made to Bay Approach on 119.5. Advise Christchurch when requirement complete. Lights will not operate or settings will not be able to be changed if communications line failure occurs. Standby power available.

	TAKE-OFF				FOR FILING AS ALTERNATE	
	Rwys 07, 25		Rwys 16, 34			
	DAY	NIGHT	DAY	NIGHT		
1 & 2 Eng	300' - 1500m		500' - 1500m		A	800' - 4000m
3 & 4 Eng					NA	B
					C	1700' - 6 km
					D	NA

① Reduced take-off minima available during Tower hours - not below 0'-800m.

NZRO/ROT
 Apt Elev **938'**
 S38 06.6 E176 19.0

JEPPESEN ROTORUA, NEW ZEALAND
 4 SEP 20 **10-9** Eff 10 Sep
ROTORUA



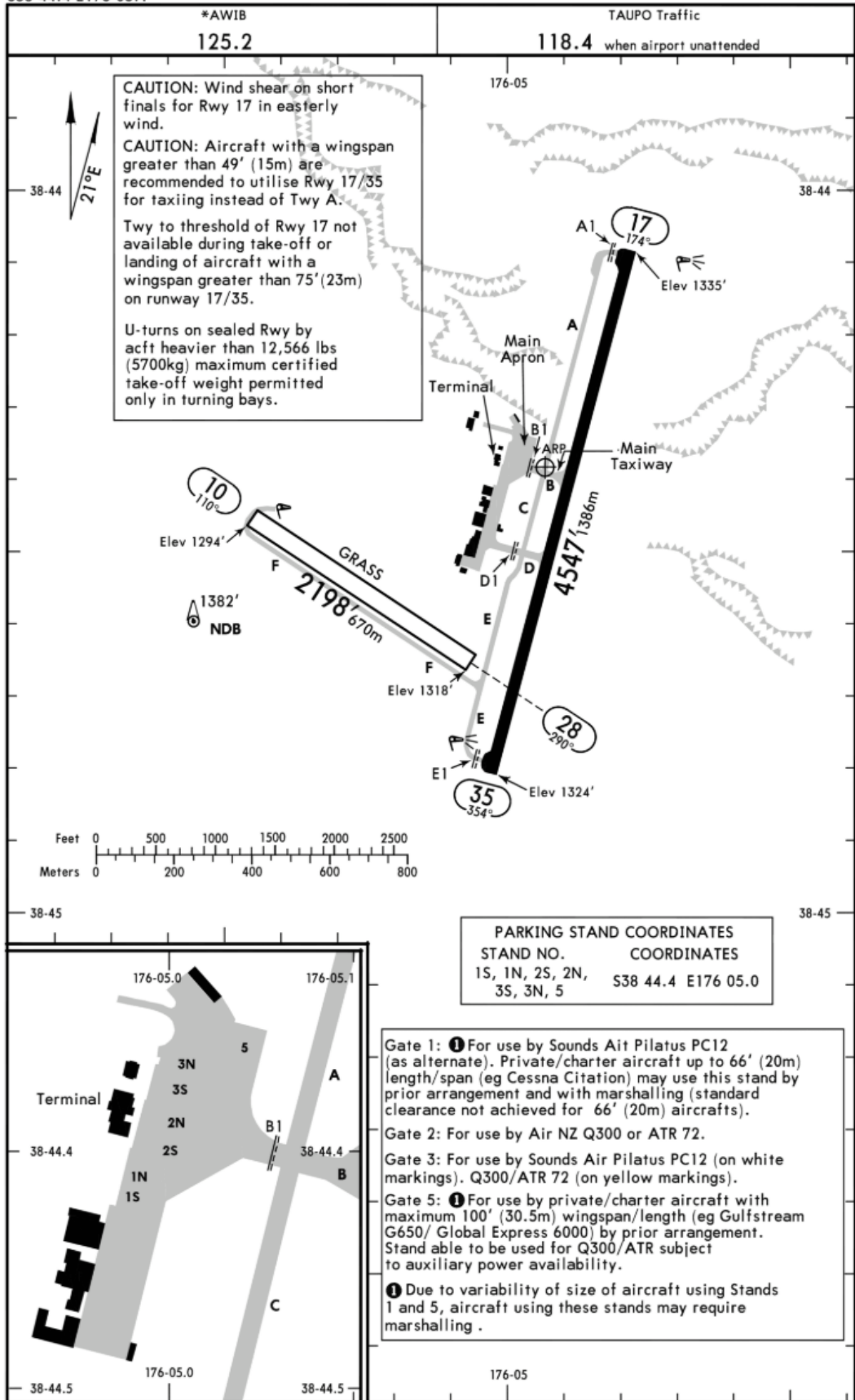
CHANGES: Mag variation, notes, bearings, buildings.

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NAVIGRAPH CHARTS INTENDED FOR FLIGHT SIMULATION ONLY - NOT FOR NAVIGATIONAL USE

NZAP/TUO
 Apt Elev 1335'
 S38 44.4 E176 05.1

JEPPESEN TAUPO, NEW ZEALAND
 4 SEP 20 (10-9) Eff 10 Sep
 TAUPO



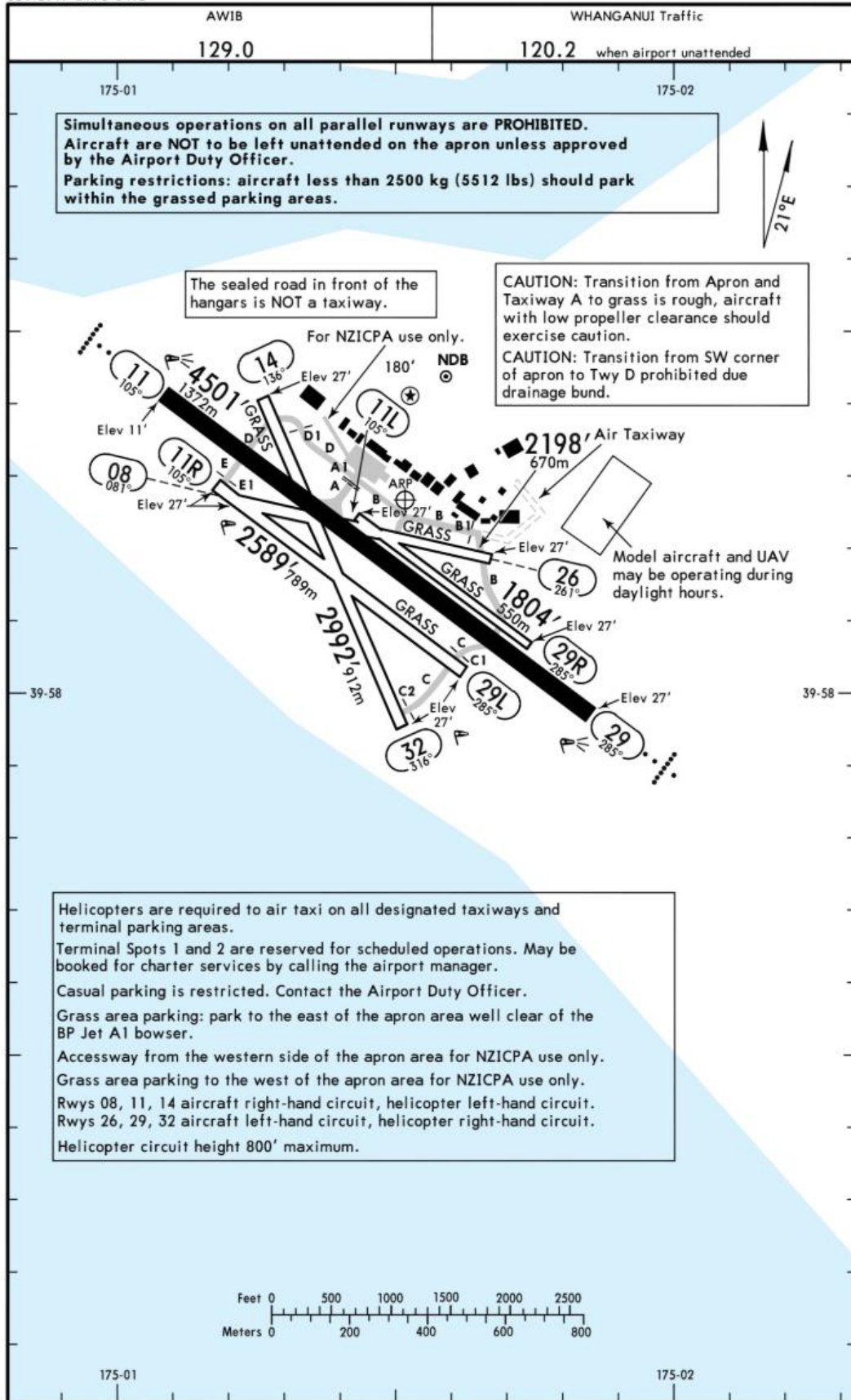
CHANGES: Caution note, gate notes, gate 4 removed, gate 5 moved.

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NAVIGRAPH CHARTS INTENDED FOR FLIGHT SIMULATION ONLY - NOT FOR NAVIGATIONAL USE

NZWU/WAG
 Apt Elev **27'**
 S39 57.7 E175 01.5

JEPPESEN WHANGANUI, NEW ZEALAND
 10 JUL 20 (10-9)
 WHANGANUI



Simultaneous operations on all parallel runways are **PROHIBITED**.
 Aircraft are **NOT** to be left unattended on the apron unless approved by the Airport Duty Officer.
 Parking restrictions: aircraft less than 2500 kg (5512 lbs) should park within the grassed parking areas.

The sealed road in front of the hangars is **NOT** a taxiway.

CAUTION: Transition from Apron and Taxiway A to grass is rough, aircraft with low propeller clearance should exercise caution.
CAUTION: Transition from SW corner of apron to Twy D prohibited due drainage bund.

Helicopters are required to air taxi on all designated taxiways and terminal parking areas.
 Terminal Spots 1 and 2 are reserved for scheduled operations. May be booked for charter services by calling the airport manager.
 Casual parking is restricted. Contact the Airport Duty Officer.
 Grass area parking: park to the east of the apron area well clear of the BP Jet A1 bowser.
 Accessway from the western side of the apron area for NZICPA use only.
 Grass area parking to the west of the apron area for NZICPA use only.
 Rwy 08, 11, 14 aircraft right-hand circuit, helicopter left-hand circuit.
 Rwy 26, 29, 32 aircraft left-hand circuit, helicopter right-hand circuit.
 Helicopter circuit height 800' maximum.

CHANGES: None. © JEPPESEN, 2007, 2019. ALL RIGHTS RESERVED.
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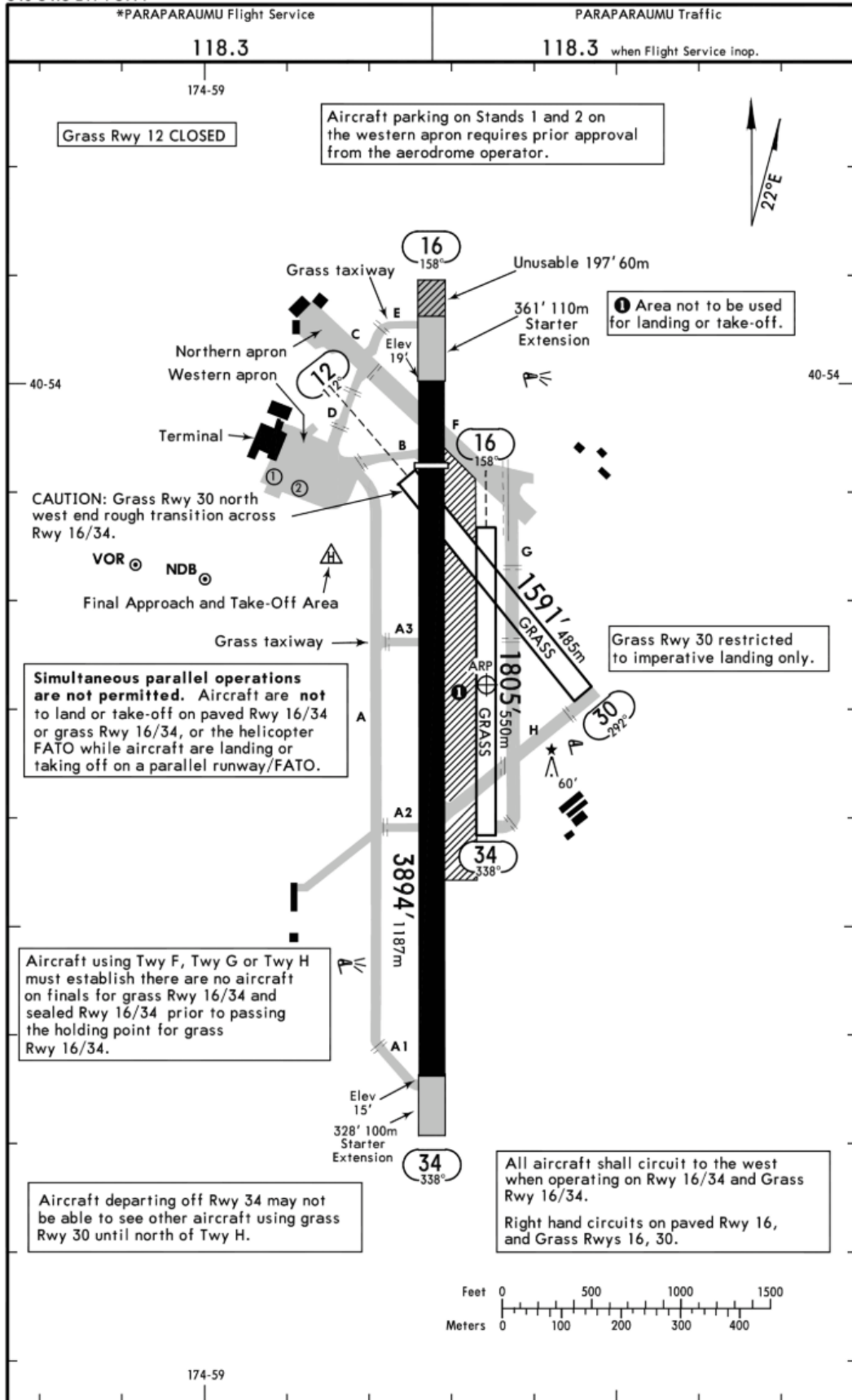
NZPP/PPQ

Apt Elev 19'
S40 54.3 E174 59.4

JEPPESEN PARAPARAUMU, NEW ZEALAND

10 JUL 20 10-9 Eff 16 Jul

PARAPARAUMU



CHANGES: Note.

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NAVIGRAPH CHARTS INTENDED FOR FLIGHT SIMULATION ONLY - NOT FOR NAVIGATIONAL USE

NZWN/WLG

Apt. Elev 41'
S41 19.6 E174 48.3

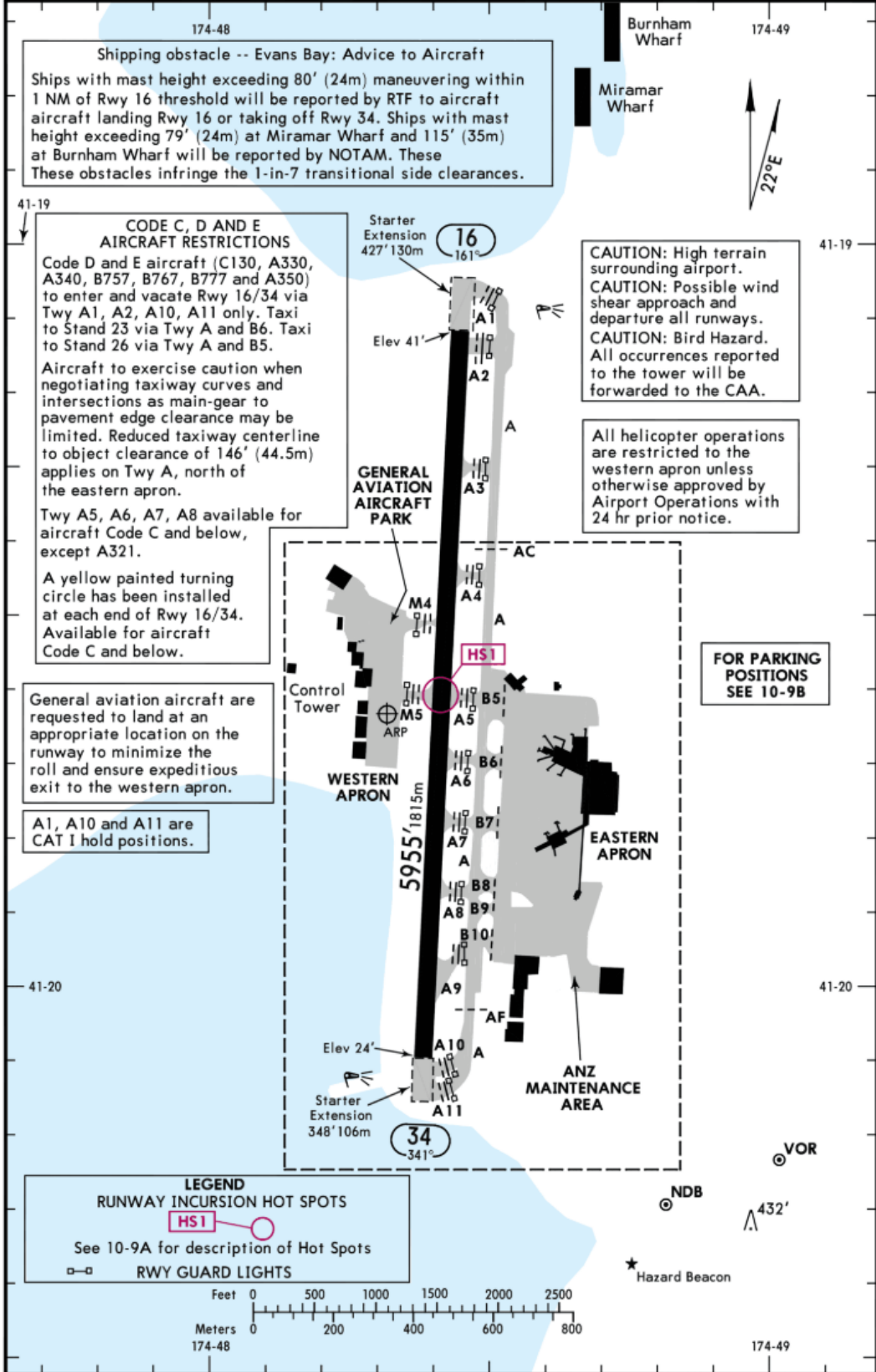
JEPPESEN

WELLINGTON, NEW ZEALAND

1 MAY 20 (10-9)

WELLINGTON INTL

*D-ATIS	Data Comm DCL	WELLINGTON Delivery	WELLINGTON Ground 1830-0900	WELLINGTON Ground 0900-1830	WELLINGTON Tower	Fire
126.9		128.2	121.9	118.8	118.8 125.25	134.7



CHANGES: Communications.

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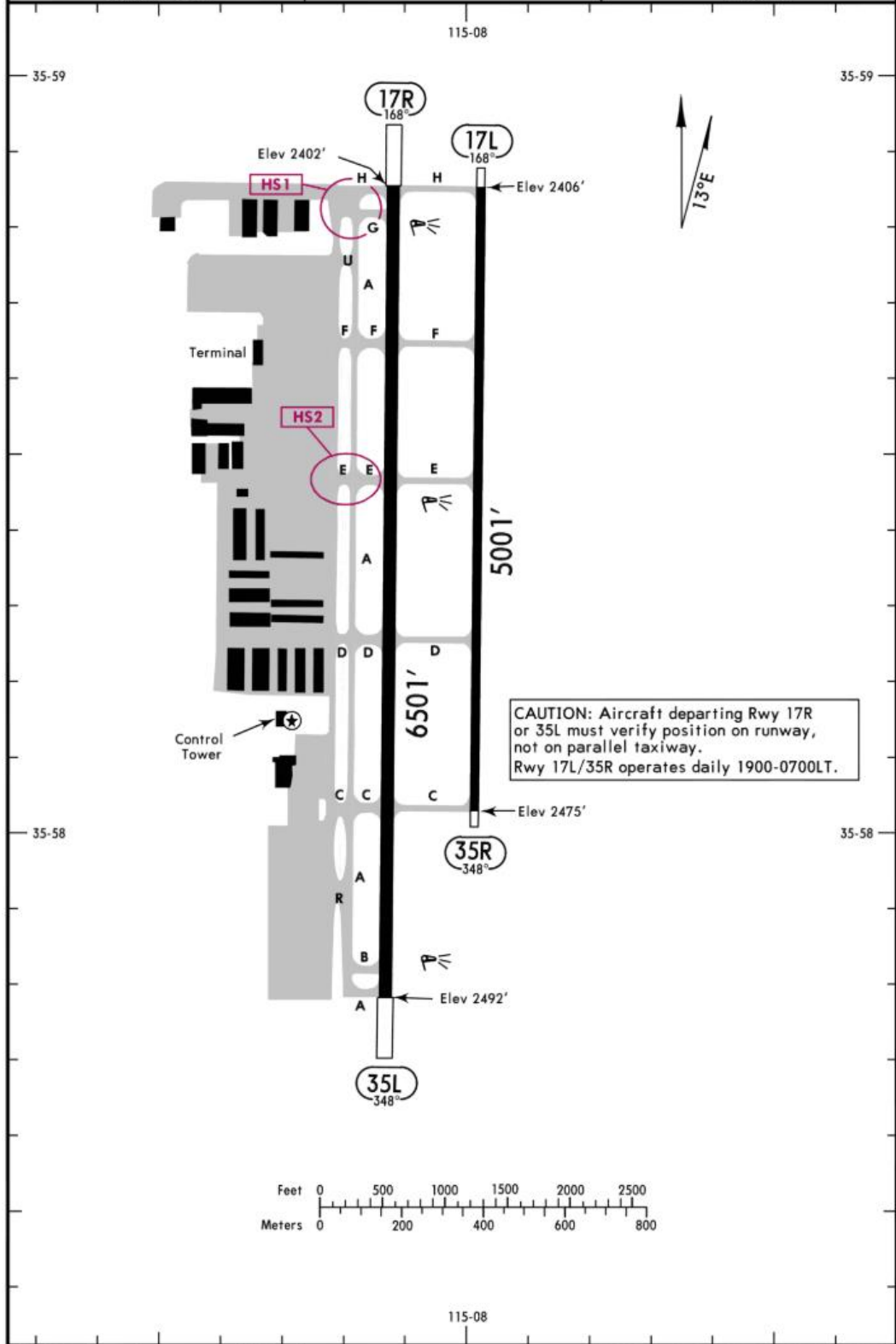
NAVIGRAPH CHARTS INTENDED FOR FLIGHT SIMULATION ONLY - NOT FOR NAVIGATIONAL USE

KHND/ HSH
 Apt Elev **2492'**
 N35 58.4 W115 08.1

JEPPESEN
 21 AUG 20 **(40-9)**

LAS VEGAS, NEV
HENDERSON EXECUTIVE

ATIS (AWOS-3PT when Twr inop) 120.775	*HENDERSON Clearance 135.35	LAS VEGAS Clearance 125.9 when Twr inop.	*HENDERSON Ground 127.8
*Tower CTAF 125.1	UNICOM 122.95		LAS VEGAS Departure (R) 118.4



CAUTION: Aircraft departing Rwy 17R or 35L must verify position on runway, not on parallel taxiway. Rwy 17L/35R operates daily 1900-0700LT.

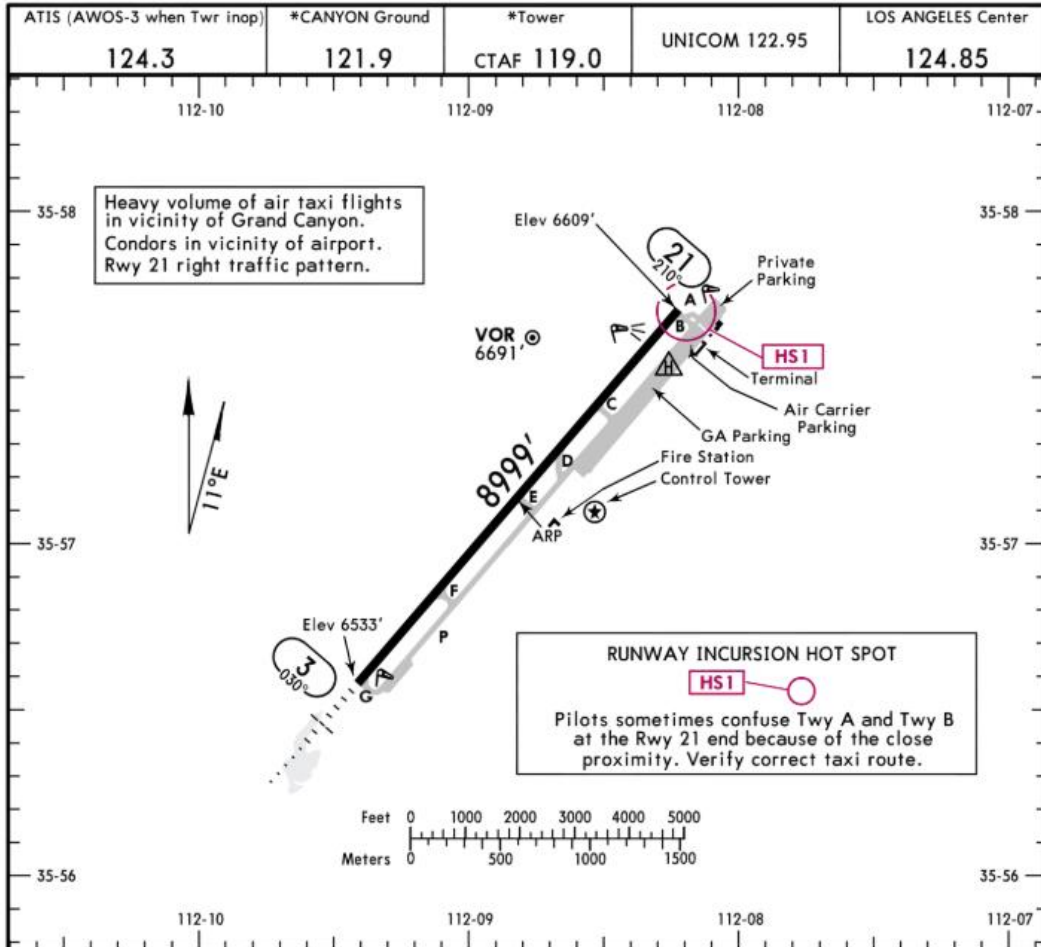
CHANGES: Notes, hotspot removed, chart format. © JEPPESEN, 2005, 2020. ALL RIGHTS RESERVED.

NAVIGRAPH CHARTS INTENDED FOR FLIGHT SIMULATION ONLY - NOT FOR NAVIGATIONAL USE

KGCN/GCN
 Apt Elev **6609'**
 N35 57.1 W112 08.8

JEPPESEN
 8 FEB 19 **(10-9)**

GRAND CANYON, ARIZ
 GRAND CANYON NATL PARK



RWY	ADDITIONAL RUNWAY INFORMATION		USABLE LENGTHS			WIDTH
			Threshold	Landing Beyond Glide Slope	TAKE-OFF	
3	① MIRL MALSR	grooved		7984'		150'
21	① MIRL REIL ① PAPI-R (angle 4.00°)	grooved				

① Activate on 119.0 when Twr inop.

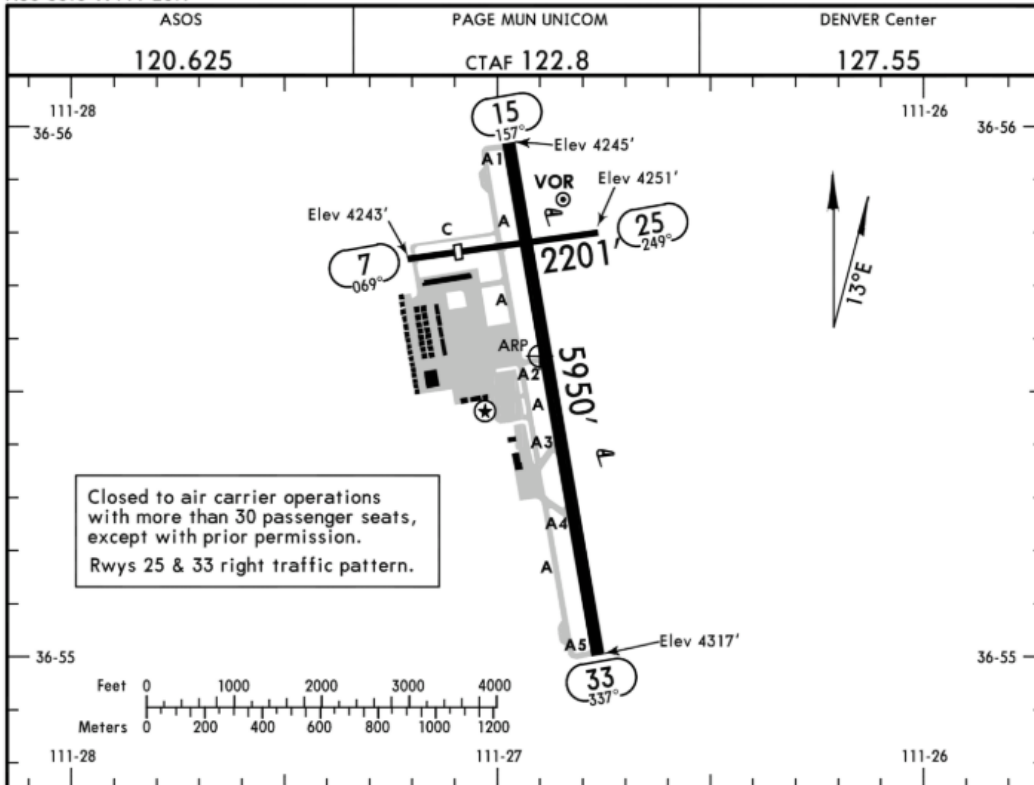
	TAKE-OFF & OBSTACLE DEPARTURE PROCEDURE		FOR FILING AS ALTERNATE			
	Rwy 21	Rwy 3	Authorized Only When Twr Operating		VOR Rwy 3	RNAV (GPS) Rwy 3
1 & 2 Eng	USE GRAND DEPARTURE	NA	A	600-2	800-2	800-2
3 & 4 Eng			B	700-2	1100-3	800-3
			C	1100-3	1100-3	1100-3
			D			

CHANGES: Communication, lighting. © JEPPESEN, 1999, 2019. ALL RIGHTS RESERVED.
NAVIGRAPH CHARTS INTENDED FOR FLIGHT SIMULATION ONLY - NOT FOR NAVIGATIONAL USE

KPGA/PGA
Apt Elev **4317'**
N36 55.6 W111 26.9

JEPPESEN
3 APR 20 **(10-9)**

PAGE, ARIZ
PAGE MUN



Closed to air carrier operations with more than 30 passenger seats, except with prior permission.
Rwys 25 & 33 right traffic pattern.

RWY	USABLE LENGTHS			WIDTH
	Threshold	Landing Beyond	TAKE-OFF	
7 ① ② 25	1613'			75'
15 33 ③ MIRL REIL VASI-L				150'

- ① Use only for periods of high winds.
- ② Weight bearing capacity, 12,500 lbs.
- ③ Activate on 122.8.

	Rwy 33				Rwy 15		Rwys 7, 25
	Adequate Vis Ref	STD	With Min climb of 285'/NM to 6500'		For Climb in Visual Conditions		
			Adequate Vis Ref	STD			
1 & 2 Eng	1/4	1	1/4	1	3100-3	NA	
3 & 4 Eng		1/2	1/4	1/2			

OBSTACLE DP: Rwy 15: Climb heading 156° to 6200', then climbing Right turn direct PGA VOR/DME. Thence cross PGA VOR/DME at or above 7700'. Continue climb in PGA VOR/DME holding pattern (hold NW, Right turns 147° inbound) to cross PGA VOR/DME at or above MEA/MCA for direction of flight.
Rwy 33: Climb heading 336° to 6000', then climbing Left turn direct PGA VOR/DME. Thence cross PGA VOR/DME at or above 7700'. Continue climb in PGA VOR/DME holding pattern (hold NW, Right turns 147° inbound) to cross PGA VOR/DME at or above MEA/MCA for direction of flight.

VISUAL CLIMB OVER AIRPORT (VCOA): Rwy 15, obtain ATC approval for visual climb over airport when requesting IFR clearance. Climb in visual conditions to cross Page Mun Airport at or above 7300' before proceeding on course.

TAKE-OFF OBSTACLE NOTES: Note: Rwy 15, Rising terrain 192' from DER, 272' right of centerline, 4323' MSL.

FOR FILING AS ALTERNATE	
RNAV (GPS) Rwy 15 RNAV (GPS) Rwy 33	VOR-B
A B C D	800-2 NA

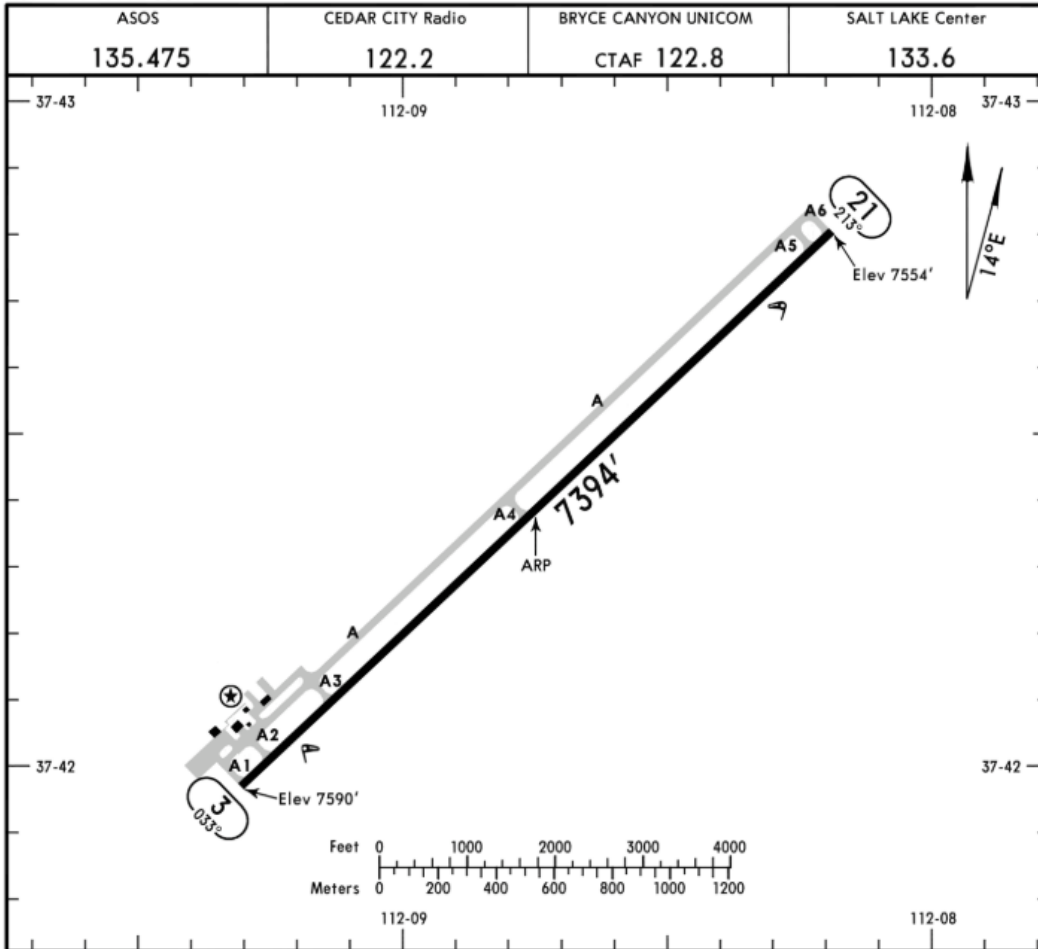
CHANGES: Taxiway C, Airport elevation, Rwy end elevations. © JEPPESEN, 2003, 2020. ALL RIGHTS RESERVED.

NAVIGRAPH CHARTS INTENDED FOR FLIGHT SIMULATION ONLY - NOT FOR NAVIGATIONAL USE

KBCE/BCE
 Apt Elev **7590'**
 N37 42.4 W112 08.7

JEPPESEN
 9 AUG 19 **(10-9)** Eff 15 Aug

BRYCE CANYON, UTAH
 BRYCE CANYON



RWY	ADDITIONAL RUNWAY INFORMATION	USABLE LENGTHS			WIDTH
		Threshold	Landing Beyond	Glide Slope	
3 21	① MIRL ① REIL ① PAPI-L (angle 3.0°) porous friction course overlay				75'

① Activate on 122.8.

TAKE-OFF		FOR FILING AS ALTERNATE	
All Rwys		RNAV (GPS) Rwy 3 RNAV (GPS) Rwy 21	
1 & 2 Eng	USE BRYCE DEPARTURE	A	800-2
3 & 4 Eng		B	
		C	
		D	NA

CHANGES: Alternate mims, lighting, ASOS frequency, Rwy length, chart format. © JEPPESEN, 2010, 2019. ALL RIGHTS RESERVED.

NAVIGRAPH CHARTS INTENDED FOR FLIGHT SIMULATION ONLY - NOT FOR NAVIGATIONAL USE

ABBREVIATIONS

Aviation is awash with abbreviated terms. This list will help you navigate a selection of the most common and useful to know abbreviations that will come up from time to time.

Bold indicates commonly used abbreviations for VFR flight.

AAL	Above Airfield Level
ACARS	Aircraft Communications and Reporting System
ADF	Automatic Direction Finding
AI	Attitude Indicator
AER	Approach End Runway
ADS	Automatic Dependent Surveillance
AFB	Air Force Base
AFM	Aircraft Flight Manual
AGL	Above Ground Level
AGNIS	Azimuth Guidance Nose in Stand
AIAA	Area of Intense Aerial Activity
ALS	Approach Lighting System
AMM	Aircraft Maintenance Manual
AMSL	Above Mean Sea Level
APU	Auxiliary Power Unit
ASDA	Accelerate Stop Distance Available
ASI	Airspeed indicator
ASU	Air Start Unit
ATA	Actual Time of Arrival
ATC	Air Traffic Control
ATIS	Automatic Terminal Information Service
ATPL	Airline Transport Pilots Licence (UK)
ATR	Airline Transport Rating (USA & Canada)
BALS	Basic Approach Light System
BC	Patches
BR	Mist
C/S	Callsign
CAA	Civil Aviation Authority
CAS	Calibrated Airspeed
CAT	Clear Air Turbulence/Approach Category
CAVOK	Cloud and Visibility OK
CB	Cumulonimbus
CDA	Continuous Descent Arrival
CDI	Course Deviation Indicator
CDL	Configuration Deviation List

CG	Centre of Gravity
CGL	Circling Guidance Lights
CLL	Centreline Lights
CPDLC	Controller-Pilot Datalink Communications
CPL	Commercial Pilots Licence
CRM	Crew Resource Management
CTR	Control Zone
CVR	Cockpit Voice Recorder
CWY	Clearway
DA	Decision Altitude
DCL	Departure Clearance
DER	Departure End of Runway
DFDR	Digital Flight Data Recorder
DH	Decision Height
DME	Distance Measuring Equipment
DST	Daylight Savings Time (Summer)
DU	Dust
DZ	Drizzle
EAS	Equivalent Airspeed
EASA	European Aviation Safety Agency
EAT	Expected Approach Time
ECAM	Electronic Centralised Aircraft Monitoring
EFB	Electronic Flight Bag
EFIS	Electronic Flight Instrument System
EGPWS	Enhanced GPWS
EGT	Exhaust Gas Temperature
EICAS	Engine Indicating and Crew Alerting System
ELT	Emergency Locator Transmitter
EMDB	Embedded
EPR	Engine Pressure Ratio
ETA	Estimated Time of Arrival
ETD	Estimated Time of Departure
ETOPS	Extended Range Twin Operations
ETP	Equal Time Point
EVS	Enhanced Vision System
EWB	Eye to Wheel Height
FAA	Federal Aviation Administration
FAF	Final Approach Fix
FALS	Full Approach Lighting System
FANS	Future Air Navigation System
FAP	Final Approach Point
FAR	Federal Aviation Regulation
FBL	Feeble/Light
FC	Funnel Cloud/TAF with validity <12hrs

FD	Flight Director
FG	Fog
FL	Flight Level
FMC	Flight Management Computer
FMS	Flight Management System
FT	TAF with validity >12hrs
FU	Smoke
FZ	Freezing
GA	Go-Around/General Aviation
GMT	Greenwich Mean Time
GNSS	Global Navigation Satellite System
GP	Glidepath
GPU	Ground Power Unit
GPS	Global Positioning System
GPWS	Ground Proximity Warning System
GR	Hail
G/S	Glideslope/Ground Speed
GS	Small Hail
H24	Applies 24hours
HDG	Heading
HG	Mercury
HIALS	High Intensity Approach Light System
HJ	Applies only in Daytime
HN	Applies only at Night
HP/hP	Holding Pattern/Hectopascals
HOT	Holdover Time
HSI	Horizontal Situation Indicator
HUD	Head Up Display
HURCN	Hurricane
HZ/Hz	Haze/Hertz
IAF	Initial Approach Fix
IAS	Indicated Airspeed
IATA	International Air Transport Association
ICAO	International Civil Aviation Organisation
IF	Intermediate Fix
IFR	Instrument Flight Rules
ILS	Instrument Landing System
IM	Inner Marker
IMC	Instrument Meteorological Conditions
INOP	Inoperative
INS	Inertial Navigation System
IR	Instrument Rating
IRS	Inertial Reference System
ISA	International Standard Atmosphere

ITCZ	Inter Tropical Convergence Zone
KM	Kilometres
KT	Knots
LCTR	Locator. Shorter range NDB.
LDA	Landing Distance Available
LIAL	Low Intensity Approach Lighting
LMT	Local Mean Time
LNAV	Lateral Navigation
LOC	Localiser
LT	Local Time
LTNG	Lightning
LTS	Lower Than Standard
LVO	Low Visibility Operations
LVP	Low Visibility Procedures
MA	Missed Approach
MAPt	Missed Approach Point
MATZ	Military Air Traffic Zone
MBST	Microburst
MCDU	Multifunction Control and Display Unit
MDA	Minimum Descent Altitude
MDH	Minimum Descent Height
MEA	Minimum Enroute Altitude
MEHT	Minimum Eye Height
MEL	Minimum Equipment List
MMEL	Master MEL
METAR	Meteorological Aerodrome Report
MFA	Minimum Flight Altitude
MGA	Minimum Grid Altitude
MHA	Minimum Holding Altitude
MI	Shallow
MIALS	Medium Intensity Approach Light System
MISAP	Missed Approach Procedure
MLW	Maximum Landing Weight
MLS	Microwave Landing System
MNPS	Minimum Navigation Performance Specifications
MOC	Minimum Obstacle Clearance
MORA	Minimum Off Route Altitude
MPS	Meters Per Second
MRA	Minimum Reception Altitude
MROT	Minimum Runway Occupancy Time
MSA	Minimum Safe Altitude
MSL	Mean Sea Level
MTCA	Minimum Terrain Clearance Altitude
MTOW	Maximum Takeoff Weight

MVFR	Marginal VFR
MZFW	Maximum Zero Fuel Weight
NADP	Noise Abatement Departure Procedure
NALS	No Approach Light System
NAVAID	Navigational Aid
NCD	No Cloud Detected
NDB	Non-Directional Beacon
NM	Nautical Mile
NOSIG	No Significant Change
NOTAM	Notice to Airmen
NPA	Non-Precision Approach
NSC	Nil Significant Cloud
NSW	Nil Significant Weather
NTZ	No Transgression Zone
OAT	Outside Air Temperature
OCA	Obstacle Clearance Altitude
OCH	Obstacle Clearance Height
OCNL	Occasional
OEI	One Engine Inoperative
OFP	Operational Flight Plan
OM	Outer Marker
OTS	Other Than Standard
OVC	Overcast
PALS	Precision Approach Lighting System
PANS	Procedures for Air Navigation Services
PAPI	Precision Approach Path Indicator
PAX	Passengers
PBN	Performance Based Navigation
PCL	Pilot Controlled Lighting
PCN	Pavement Classification Number
PDC	Pre-Departure Clearance
PDG	Procedure Design Gradient
PFD	Primary Flight Display
PIC	Pilot in Command
PL	Ice Pellets
PN	Prior Notice Required
PO	Dust/Sand Whirls
POB	Persons on Board
PRFG	Partial Fog
PRNAV	Precision Area Navigation
PROB	Probability
QDM	Magnetic Heading to Station
QDR	Magnetic Bearing from Station

QFE	Air Pressure at Airfield Level
QFU	Magnetic Orientation of Runway
QNH	Air Pressure at Sea Level
QRH	Quick Reference Handbook
RA	Rain
RAIL	Runway Alignment Indicator Lights
RAIM	Receiver Autonomous Integrity Monitoring
RASN	Rain and Snow
RCLL	Runway Centreline Lights
RCLM	Runway Centerline Markings
REDL	Runway Edge Lights
REIL	Runway End Indicator Lights
RENL	Runway End Lights
RET	Rapid Exit Taxiway
RFFS	Rescue and Fire Fighting Services
RTIL	Runway Threshold Identification Lights
RMI	Remote Magnetic Indicator
RMK	Remark
RNAV	Area Navigation
ROC	Rate of Climb
ROD	Rate of Descent
RSC	Runway Surface Condition
RTIL	Runway Threshold Identification Lights
RVR	Runway Visual Range
RVSM	Reduced Vertical Separation Minima
SA	Sand
SAR	Search and Rescue
SCT	Scattered
SEV	Severe
SELCAL	Selective Calling
SFC	Surface
SG	Snow Grains
SH	Showers
SI	International System of Units
SID	Standard Instrument Departure
SIGMET	Significant Meteorological Information
SIGWX	Significant Weather
SKC	Sky Clear
SLP	Speed Limiting Point
SM	Statute Miles
SMC	Surface Movement Control
SNOCLO	Airport Closed due to Snow
SQ	Squall
SRA	Surveillance Radar Approach
SS	Sandstorm

STAR	Standard Terminal Arrival Route
SWY	Stop way
TA	Transition Altitude
TAF	Terminal Area Forecast
TAS	True Airspeed
TCAS	Traffic Alert and Collision Avoidance System
TCH	Threshold Crossing Height
TCU	Towering Cumulus
TDO	Tornado
TDZ	Touchdown Zone
TECR	Technical Reason
TEMPO	Temporary
TL	Transition Level
TS	Thunderstorm
U/S	Unserviceable
UAV	Unmanned Aerial Vehicle
UNREL	Unreliable
UTC	Coordinated Universal Time
VA	Volcanic Ash
VASI	Visual Approach Slope Indicator
VC	Vicinity
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions
VMCA	Minimum Control Speed (Airborne)
VOLMET	Weather reports for aircraft inflight
VOR	VHF Omnidirectional Range
VPT	Visual Manoeuvre with Prescribed Track
VRB	Variable
VV	Vertical Visibility
WEE	Whichever is Earlier
WEL	Whichever is Later
WGS-84	World Geodetic System 1984
WIP	Work in Progress
WKN	Weakening
WS	Windshear
WTH	Wheel to Threshold Height
WX	Weather
WXR	Weather Radar
XPDR	Transponder