2.16. Emergency Airfields. During flight planning, select certain airfields along the planned flight route as possible emergency landing areas and then annotate these airfields on the charts for quick reference. Consider the following factors when selecting an emergency airfield: type of aircraft, weather conditions, runway length, runway weight-bearing capacity, runway lighting, and radio NAVAIDs. The NOTAMs for these airfields should be checked prior to flight.

2.17. Highest Obstruction. After the route has been determined, the navigator should study the area surrounding the planned route and annotate the highest obstruction (terrain or cultural). The distance within which the highest obstruction will be annotated is IAW governing or local directives. The highest obstruction will be taken into consideration when determining the minimum en route altitude (MEA) and in emergency procedures discussion.

2.18. Special Use Airspace. When determining the flight planned route, the locations of special use airspace will have to be considered. The best way to find the locations of the areas is by checking an en route chart. After the route is determined, any special use airspace that may be close enough to the route of flight to cause concern (as per governing directives) should be annotated on the chart with pertinent information. Annotate time and days of operation, effective altitudes, and any restriction applicable to that area. These areas, when annotated on the chart, will assist the navigator with in-flight mission changes and prevent planning a route of flight that cannot be flown.

Section 2F—Flight Plans

2.19. Manual Flight Plans. Flight plans differ in format between services and commands. To meet specialized operational requirements, each command prescribes and issues its own navigation forms. Typical completed flight plan forms are shown in Figures 2.2 and 2.3. There are slight differences in the flight plan columns; the main differences are in the time and fuel analysis sections. The headings and columns on the forms are self-explanatory.

2.20. Computer Flight Plans. Computer flight plans can be obtained from operations or weather personnel prior to departure. The navigator computes only additional information required by local procedures, such as equal time point (ETP) or fuel analysis. A typical computer flight plan is illustrated in Figure 2.4. There are many different types of computer flight plans; they provide essentially the same information, but in different formats.

2.21. Fuel Analysis. For the following fuel planning discussion, refer to Figure 2.2.

2.21.1. En Route Fuel. En route fuel is determined with a fuel graph such as the one depicted in Figure 2.5. Each type aircraft has a series of fuel graphs based on: (1) aircraft gross weight, (2) pressure or density altitude, (3) true airspeed (TAS) or Mach number and on some aircraft, (4) the aerodynamic drag of external stores. En route fuel is computed in a manner that will take into account the worst fuel consumption situation, such as the lowest cruise altitude and highest airspeed. Most fuel graphs will be designed for standard day conditions, so temperature deviation will have to be considered. En route fuel can be calculated from the start descent point or initial approach fix (IAF), whichever is specified by the command.

Figure 2.2. Typical Air Force Flight Plan.

MISSION PREFLIGHT LOG

NAVIGATOR: LT SMITH	TRAINING MISSION COMMANDER: CAPT GREEN	AIRCRAFT COMMANDER: CAPT ALLEN	MISSION: CN GM 11				
DESTINATION: Nervanna AFB N44-52.3 W120-00.0	ROUTE:	SQUADRON: 562 FTS	CLASS: 90-15	CREW: N01	SCHEDULE / ACTUAL TAKEOFF: Z / Z	DATE OF TAKEOFF: (Z) 13 SEP 1993	

ROUTE IDENT	FROM: Fairchild AFB N47-37.1 W117-39.3 / ROUTE	T. C. OR G. C.	W / V / DC	T. H. OR G. H.	VAR. OR GRIV.	M. H.	M. C.	TEMP / ALT	TAS / TRUE MACH	GS	GRD DIS / ACC. GRD DIS	TIME / ACC. TIME	PROP / ETA	RETA / ATA	A OR B	REMARKS
	GEG 185 / 21 N47-15.2 W117-51.4	150	140 / 20 / -1	149	-19	130	131	↙ ° / ↗ M	375	358	32 / 32	+05 / +05				
	L / O	206	✓ / ✓ / -3	203	✓	184	187	↓ ° / M	✓	368	73 / 105	+12 / +17				AD = 106
A	PDT N45-42.0 W118-56.0	206	160 / 60 / -6	200	✓	181	✓	-54 ° / 33.0 M	417 / .72	375	30 / 135	+05 / +22				Dept, ROP N45-36.0
B	N47-00.0 W114-00.0	068	265 / 70 / -3	065	-18	047	050	° / M		480	226 / 361	+28 / +50				W118-45.0
C	N48-31.0 W107-35.0	071	✓ / ✓ / ✓	068	-17	051	054	° / M		✓	278 / 639	+35 / 1+25				ROP N48-29.0 W107-27.0
D	N45-00.0 W102-00.0	132	295 / 50 / +2	134	-13	121	119	° / ↓ M	↓	465	316 / 955	+41 / 2+06				ROP N44-52.0 W102-06.0
E	N45-08.5 W108-00.0	274	270 / 90 / 0	274	✓	261	261	-56 ° / 35.0 M	413 / .72	325	264 / 1219	+49 / 2+55				
F	N45-08.5 W114-00.0	270	✓ / ✓ / ✓	270	-16	254	254	° / M		✓	256 / 1475	+47 / 3+42				
G	N44-52.3 W120-00.0	266	✓ / ✓ / ✓	266	-18	248	248	° / ↓ M	↓	✓	257 / 1732	+47 / 4+29				TERM
			/					° / M								
			/					° / M								
			/					° / M								
			/					° / M								
			/					° / M								
			/					° / M								
			/					° / M								
			/					° / M								
			/					° / M								
			/					° / M								
	TERMINAL ALTERNATE:		/					° / M								A. D. =

OPERATING WT: 65.5	CLIMB TEMP DEV: -10	AFCT CALL SIGN: G-13
CARGO / PAX WT: 12.0	CRUISE TEMP DEV: 0	AFCT SERIAL NO: 1234
RAMP FUEL WT: 32.5	TAKEOFF WT: 109.0	AFCT TYPE: T-43A
RAMP GROSS WT: 110.0	PG: XX	

	TIME	FUEL
1. ENROUTE	4+29	24.8
2. RESERVE	1+00	4.0
3. ENROUTE PLUS RESERVE	5+29	28.8
4. ALTERNATE AND MISSED APPROACH	—	—
5. HOLDING	—	—
6. APPROACH / LANDING	+15	1.0
7. IDENTIFIED EXTRA		—
8. TOTAL (3 + 4 + 5 + 6 + 7) TAKEOFF / FLAPS UP	5+44	29.8
9. TAXI AND RUN UP (Acceleration)		1.0
10. REQUIRED RAMP		30.8
11. ACTUAL RAMP		
12. UNIDENTIFIED EXTRA		
13. REQUIRED OVER DEST (4 + 5 + 6)		

ENDURANCE HRS	BURN OFF (1 + 6 + 7) LBS
HIGHEST ACCEPTABLE FL	LOWEST ACCEPT. FL
WIND FACTOR: TOTAL	1ST HALF / 2ND HALF

TOTAL DISTANCE ( ) / (WF2 - WF1) + 2 (TAS) ( ) = T ( ) MIN ▲

TOTAL TIME - T = TIME TO ETP

Figure 2.3. Typical Navy Flight Plan.

O	A	SQUADRON TYPE: NP	SQUADRON NUMBER: 47	SORTIE NUMBER: M024	YEAR: 9	MONTH: 02	ZONE: Z	DAY: 14	B	MODEX/SIDE NUMBER: P3C/158574	NAVIGATOR'S NAME: LT LUHRMAN (USN)	CLASS / HANDL	PAGE 1 OF 2

TIME OF EVENT	EVENT TYPE CODE A	LATITUDE DEG./MIN./N/S	LONGITUDE DEG./MIN./E/W	METHOD CODE B	COMP.	DEV.	MAG.	VAR E	TRUE	DRIFT L OR R	COURSE	GROUND SPEED	WINDS DIR.	WINDS VEL	HOW CODE C	CAS.	+ OR – TEMP.	ALT.	TAS.	ETE DIST.	ETE MIN.	ETA TIME	REMARKS
	PRE	28 12 N	177 23 W				221	10	231	1L	230	357	280	05	F		↘	↗	360	112	+18		MIDWAY → NQM 220/112
	✓	27 00 ✓	179 00 ✓				264	✓	274	1L	273	420	320	09	F	250	-36	310	426	53	+08		NQM 220/112 → 2702N 18000W
	✓	27 02 ✓	180 00 ✓				263	9	272	1L	271	420	✓	✓	✓	✓	✓	✓	✓	276	+39		2702N 18000W → 2703N 17500E
	✓	27 03 N	175 00 E				263	7	270	0	270	421	320	08	F	249	-35	310	426	160	+23		2703N 17500E → 27N 172E
	✓	27 00 ✓	172 00 ✓				218	6	224	0	224	428	330	07	F	✓	✓	✓	✓	164	+23		27N 172E → 2500N 16955E
	✓	25 00 ✓	169 55 ✓				217	6	223	0	223	430	360	06	F	✓	✓	✓	✓	323	+45		2500N 16955E → 21N 166E
	✓	21 00 ✓	166 00 ✓				155	6	161	1R	162	430	010	05	F	260	-33	290	426	107	+15		21N 166E → WAKE

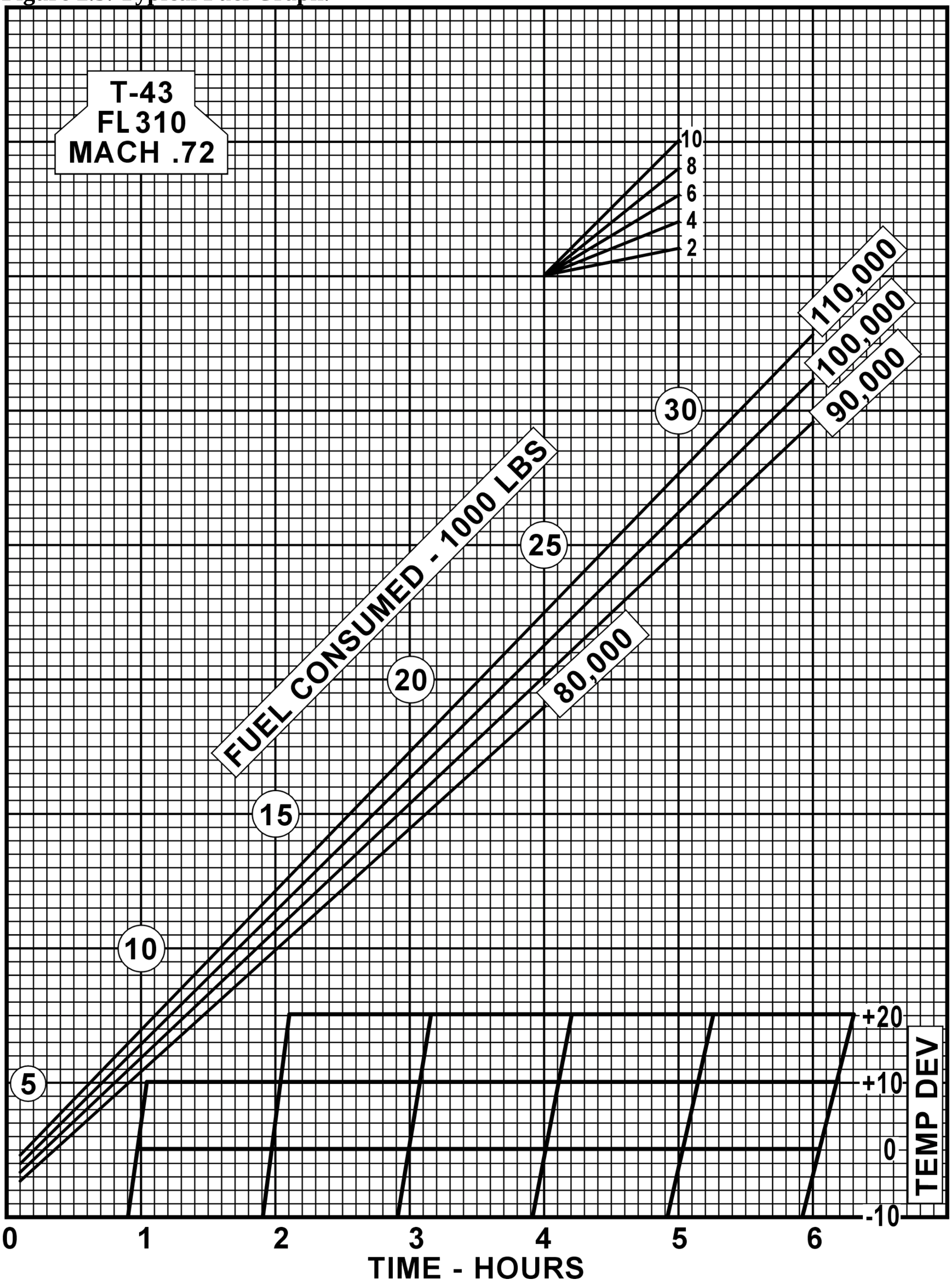
Figure 2.4. Typical Computer Flight Plan.

AMC COMPUTER FLIGHT PLAN M.72 CFPI-1621648.0
KCHS TXKF H T-43A .GB. 11/20Z-04Z
KCHS..MET AR4 OLD G446 JAI R513 PRS..TXKF
OPTIMIZED FUEL PLAN
OPNLWT 65500 PAYLOAD 3000
ARR FUEL/TIME BIAS 01000 / 0015

WP LOCID	ID	TC	MC	ALT	GS	ZD	ZT	BO	ETA	ATA
LAT	CHNL		MH	TD	TAS		TT	FLRM		
LON	FREQ		WIND				TDR	TTR		OW
1 CHARLESTON A &									___	___
N32539							0209			
W080024							820	0155		
2 METTA		108	115	...	...	89	14	22	___	___
N32261			115	...	...	14	0187			
W078228							731	0141		
3 MILOE		113	121	...	...	22	3	5	___	___
N32173			125	...	...	17	0182			
W077585							709	0138		
4 OLDEY		104	112	...	...	7	1	2	___	___
N32157			116	...	...	18	0180			
W077512							702	0137		
0 TOC/ LEVEL OFF		141	149	370	...	15	3	4	___	___
			155	06	...	21	0176			
			270/026				687	0134		
5 JAINS		141	149	370	429	55	8	6	___	___
N31213			155	06	418	29	0170			
W077000			250/044				632	0126	A	
6 BURTT		084	094	370	464	195	25	19	___	___
N31401			095	06	418	54	0151			
W073130			250/047				437	0101	A	
7 PRISS/INTX		87	101	370	474	47	6	4	___	___
N31560			100	05	417	127	0127			
W068110			270/057				179	0028	A	
0 BEGIN DESCENT		81	096	370	473	67	8	6	___	___
			094	05	417	135	0121			
			280/059				112	0020		
8 BERMUDA NAS &		81	096	...	...	112	20	15	___	___
N32219			094	...	...	155	0106			
W064414			0	0000						

FIRS KZNY/0029
CFP ALT FWF 47 WF1 39 WF2 54 ENDURANCE 0422 TOGW 089 05
A1 KCHS ALT TDEV WIND TAS GS ZD AD ZT TOGW
CHARLESTON 310 09 253/043 380 339 776 870 217 089
N32539 W080024
1 -ENROUTE 0155 009302 8-SUBTOTAL 0439 020853
2 -RESERVE 0012 000835 9-TAXI 001000
3 -ENROUTE/RES 0207 010137 10-REQ D RAMP 021853
4 -ALTERNATE 0217 009716 11-ACTUAL RAMP ______
5 -HOLDING 0000 000000 12-UNID EXTRA ______
6 -APP&LANDING 0015 001000 13-REQ D O/H DEST 010716
7A-ID EXTRA 000000 14-B/O 010302
7B-STORED FUEL 000000
FL 370/LO
A2 KDOV ALT TDEV WIND TAS GS ZD AD ZT TOGW
DOVER 310 07 262/031 376 354 663 704 152 087
N39076 W075279
1 -ENROUTE 0155 009133 8-SUBTOTAL 0414 018971
2 -RESERVE 0012 000819 9-TAXI 001000
3 -ENROUTE/RES 0207 009952 10-REQ D RAMP 019971
4 -ALTERNATE 0152 008019 11-ACTUAL RAMP ______
5 -HOLDING 0000 000000 12-UNID EXTRA ______
6 -APP&LANDING 0015 001000 13-REQ D O/H DEST 009019
7A-ID EXTRA 000000 14-B/O 010133
7B-STORED FUEL 000000
FL 370/LO

Figure 2.5. Typical Fuel Graph.



2.21.2. Fuel Reserve. This is the quantity of fuel carried in excess of mission requirements if the flight is completed as planned. Major commands are authorized to establish fuel requirements for assigned aircraft. In the absence of command established reserves, refer to AFI 11-202, Volume 3, for additional information.

2.21.3. En route Plus Reserve. Add en route time and reserve time together to obtain the en route plus reserve time. In some commands, this fuel is extracted from the fuel graph in the same manner as the en route fuel.

2.21.4. Alternate Fuel. The fuel to the alternate is based on the fuel flow for the gross weight of the aircraft at destination, the true airspeed (TAS) and altitude flown to the alternate. Some flight manuals include graphs designed for computing fuel to the alternate, but the fuel can also be computed by adding the time to the alternate and to the en route time. This time is then used to extract the total fuel required from takeoff to alternate. En route fuel is then subtracted from this to obtain the fuel to the alternate. A standard fuel amount may be added to allow for a missed approach at the original destination.

2.21.5. Holding Fuel. Adverse weather, air traffic, or aircraft malfunction in the terminal area may force the aircraft to hold in the local area for a period of time before landing. The amount of holding fuel is based on any planned delays according to applicable directives.

2.21.6. Approach and Landing Fuel. Approach and landing fuel is the fuel required from the terminal fix to the runway. This is computed for a prescribed amount of time (usually 15 minutes). The amount of fuel needed for approach and landing varies with the aircraft.

2.21.7. Total Takeoff or Flaps Up. This is the cumulative total fuel from takeoff or flaps up that is required for en route, reserve, alternate, holding, and approach and landing.

2.21.8. Taxi and Runup. The fuel needed for taxiing, engine runup, and acceleration to takeoff speed. It is usually a predetermined value for each type of aircraft.

2.21.9. Required Ramp Fuel. The amount of fuel required at engine start to complete the mission.

2.21.10. Actual Ramp Fuel. The fuel on board prior to engine start.

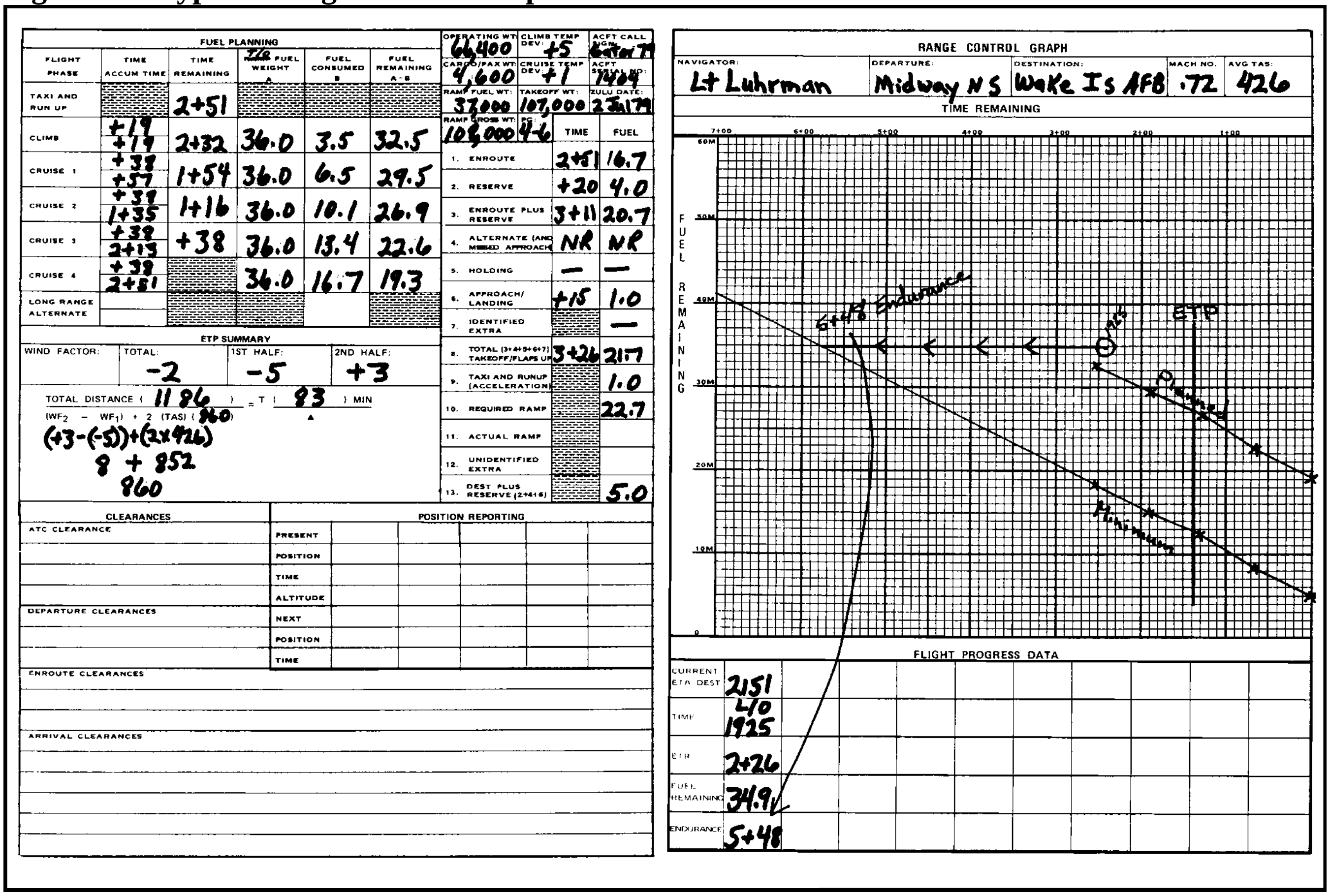
2.21.11. Unidentified Extra Fuel. Additional fuel over and above that required by the flight plan. It is the difference between required ramp fuel and actual ramp fuel.

2.21.12. Burnoff Fuel. Burnoff is the planned amount of fuel to be used after takeoff. This value subtracted from takeoff gross weight is equal to the approximate aircraft gross weight at landing.

2.22. Range Control Graph. The Range Control Graph portrays planned, minimum, and actual fuel consumption. A typical range control graph is shown in Figure 2.6. It is used to flight plan fuel consumption and serves as an in-flight worksheet for comparing actual and planned fuel consumption. The range control graph can be constructed with information taken from a completed flight plan such as Figure 2.2 and the applicable fuel planning graph (Figure 2.5). After calculating the required fuel at checkpoints along the route, the fuel remaining (vertical) is plotted against time remaining (horizontal). The planned fuel consumption is then plotted on the graph along with the minimum required fuel line.

In-flight fuel readings are taken periodically and plotted on the graph to determine the fuel consumption in relation to that planned.

Figure 2.6. Typical Range Control Graph.



2.22.1. The planned line is determined by calculating the fuel remaining and time remaining at predetermined points in the mission and then plotting these points on the graph and connecting them with a line. The minimum line is determined by adding up all fuel required as a minimum at the destination (reserve, alternate, approach, etc.) and plotting it on the zero time remaining line. The difference between the minimum fuel required and the planned fuel on the zero time remaining line is then plotted below each of the predetermined fuel remaining points on the planned line. The points are connected with a line that represents the minimum required fuel line. This line is used to determine whether or not to continue the mission.

2.22.2. In-flight fuel readings are obtained and plotted against time remaining to determine fuel status. These plotted points are then connected with a dotted line that represents the actual fuel consumption. The trend of the in-flight fuel readings indicates actual fuel consumption and is used to make mission decisions with regard to fuel.

2.23. Equal Time Point (ETP). The ETP (Figure 2.7) is that point along the route (normally one with an extended overwater leg) from which it takes the same amount of time to return to departure (or the